U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY—Bulletin No. 81.
A. D. MELVIN, D. V. S., Chief of Bureau.

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THE MILK SUPPLY

OF

BOSTON, NEW YORK, AND PHILADELPHIA.

BY

GEORGE M. WHITAKER, M. A., Sc. D.,
Dairy Inspector, Bureau of Animal Industry.

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Animal Industry,
Washington, D. C., December 2, 1905.

Sir: I have the honor to transmit the accompanying report on "The Milk Supply of Boston, New York, and Philadelphia," written by George M. Whitaker, M. A., Sc. D., of this Bureau, and to recommend its publication as Bulletin No. 81 of the Bureau of Animal Industry series.

Respectfully,

A. D. Melvin,
Chief of Bureau.

Hon. James Wilson, *Secretary.*

Dy.—65.

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THE MILK SUPPLY OF BOSTON, NEW YORK, AND PHILADELPHIA.

By GEORGE M. WHITAKER, M. A., Sc. D.,
Dairy Inspector, Bureau of Animal Industry.

PART I.—THE MILK SUPPLY OF BOSTON.

EXTENT OF POPULATION SUPPLIED.

The milk supply of Boston really means the milk supply of what is locally known as the "Greater Boston." This includes at least nine municipalities, the population of which is as follows:

Boston	560,000	Brookline	20,000
Cambridge	92,000	Revere	10,000
Somerville	61,000	Winthrop	6,000
Chelsea	34,000		
Malden	33,000	Total	840,000
Everett	24,000		

The territory supplied by the Boston milk system does not exactly conform to municipal lines, so that doubtless a part of the population in contiguous territory could also be properly added to the above. For example, one large wholesale establishment handling Boston milk does a considerable business in the near-by city of Lynn, which has a population of 68,000 and is not ordinarily included in Greater Boston.

Probably we are not far out of the way in assuming that the Boston milk supply reaches 900,000 people. Immediately about Boston and the several small towns and cities composing Greater Boston there are nine towns and cities, with 110,000 inhabitants; or, if Lynn is included, 178,000. Some of these places receive Boston milk. In many instances this territory is so thickly settled that the traveler, noticing the continuous line of houses, sees no division of one municipality from another. The number of cities and towns concerned has been overlooked by some writers on the question of the Boston milk supply, and has led to an exaggerated statement of the per capita consumption.

HANDLING MILK AT BOSTON.

From 80 to 85 per cent of the milk consumed in Greater Boston is transported by railroad and the remainder in wagons. In local nomenclature, "car milk" and "wagon milk" are common terms

for these two classes of milk. Of the railroad milk, nearly all is handled by five wholesale houses that do business on a plan which seems to be peculiar to Boston. These large wholesalers are locally known as "contractors." They contract for and buy the milk in the country, lease railroad milk cars, manage the transportation to the

FIG. 1.—Map showing the source of Boston's milk supply.

city, and sell most of their supplies to peddlers for distribution at retail. Originally the contractors did an exclusively wholesale business, but of late years there has been a growing tendency to branch out into the retail business. A part of this business was forced upon them by their being obliged to take retail routes on account of debts

for milk due them by the peddlers; but recently this retailing of milk has seemed to be more of a deliberate policy. A few large retailers buy their supplies direct from the farmers, but the greater portion of the business of buying and receiving is done by the contractors. These five large wholesale concerns, though technically entirely separate, have a common understanding and practice in many details of the business. One person is at the head of three of the corporations, and it may be said that three officials could practically determine any question of policy for the whole business were they so disposed.

The cream supply of the city is not in such intimate connection with the milk business as is the case in New York. The contractors do a large cream business in connection with the milk trade, but much of the city cream comes from skimming stations entirely distinct from the contractors' system of milk collection and transportation. Large quantities of cream come to the city from Maine creameries, which were established primarily for the manufacture of butter; but they have drifted entirely into the cream business, and this has grown to such proportions that it has become necessary greatly to enlarge their plants. Skimming stations have been established, and the whole of their attention is given to the collection and distribution of cream.

The milk of the city is handled in $8\frac{1}{2}$-quart cans, so that any use of the word "can" in connection with the Boston business means $8\frac{1}{2}$ quarts, although many of the older cans are so battered that they do not hold over 8 quarts.

STATISTICS OF SHIPMENT.

MILK BROUGHT IN BY THE RAILWAYS.

For several years the contractors purchased an unlimited amount of milk from the producers on the agreement that they would pay the "milk" price for all that they could sell again and "butter value" for the surplus. Consequently the contractors reported to the farmers from month to month the amounts of their receipts and sales. The following table shows in round figures the magnitude of their business for a period of years:

Number of cans of milk received at Boston for several years.

Year.	Received.	Sold.	Surplus.
1891	7,000,000	6,000,000	1,000,000
1894	9,000,000	7,000,000	2,000,000
1896	10,000,000	8,000,000	2,000,000
1897	11,000,000	8,000,000	3,000,000
1899	11,000,000	9,000,000	2,000,000
1900	10,000,000	9,000,000	1,000,000
1901	9,000,000	8,000,000	1,000,000

The table shows increasing receipts up to 1897, when the highest point was reached—11,789,191 cans. Since then the receipts gradually declined until 1901, when they were 9,886,303 cans. This reduction was not due so much to a decrease in sales or in milk consumption as to a decline in the surplus. The surplus in 1897 was 3,059,619 cans and in 1901 as low as 1,430,166 cans. The sales of milk for the five years from 1897 to 1901, inclusive, were fairly uniform, ranging from 8,975,538 cans in 1900 to 8,456,137 in 1901. These figures, while accurate, do not in all instances correctly show the growth of the business; changes in the business of the contractors—such as, for instance, the buying out of competing peddlers—in some cases increased the figures, although no more milk was actually consumed. On the other hand, increased competition from outside dealers might lessen the contractors' business.

In 1902, because the producers insisted on a new way of making settlement for surplus milk, the contractors quit reporting the amount of the business. In 1904 the State railroad commission required the railroads to report their receipts of milk to the board, and statistics were again available. But, for purposes of comparison, it should be remembered that the contractors reported only their own business, while now the roads report to the railroad commission all the milk transported by them.

The following includes a report for nine months of receipts by the contractors in 1901–02:

	Cans.		Cans.
July	941,652	December	756,707
August	856,878	January	813,077
September	813,127	February	743,838
October	846,368	March	875,340
November	739,101		

The next table shows the receipts for nine months in 1904–05 as reported by the railroads:

	Cans.		Cans.
July	1,112,345	December	998,768
August	1,039,403	January	1,016,501
September	1,002,623	February	942,122
October	968,099	March	1,098,041
November	931,653		

The percentage of milk brought in by the different railroads fluctuates from month to month, but is substantially as follows:

	Per cent.
Boston and Maine	68
New York, New Haven and Hartford	20
Boston and Albany	12
Total	100

The amount of wagon milk entering into the Boston milk supply is entirely a matter of estimate. Some authorities estimate it to be one-fourth of the whole amount and others one-third. When the railroad milk amounts to 1,000,000 cans per month, the wagon milk probably ranges between 250,000 and 333,000 cans. Some of this milk is brought into the city by producers, and some is handled by middlemen, who buy their supplies from their neighbors and haul it to the city, where they sell it to hotels, restaurants, or retailers. Not much of this wagon milk is retailed in small quantities by those who haul it into the city. Most of it is brought into the city during the latter part of the night and is ready for the morning business. The wagons which transport this milk are not made specially for the business. Most of them have a canopy top. The cans are covered by a canvas, under which a lantern may be placed in the winter to prevent freezing, or a cake of ice in the summer for cooling. This wagon milk is gradually decreasing in amount as the agricultural land about the city increases in value and is more profitably devoted to market gardening than to dairying. Most of the wagon milk that comes to the city is produced within a radius of 25 miles.

PER CAPITA CONSUMPTION.

It is estimated that the contractors' receipts average 1,000,000 cans per month, and that the wagon milk is 250,000 additional. On this basis we have 1,250,000 cans as a monthly supply, or 10,625,000 quarts. This is 343,000 quarts per day, which, being divided among 900,000 (maximum estimate) people, would give 0.76 pint per day per capita; divided among 800,000 (minimum estimate), we have 0.86 pint per capita. Either figure is within reason.

SYSTEM OF PAYMENT.

The price which the contractors pay the producers for milk depends upon the distance that the milk must be transported. The city price being fixed, the following is the scale of discounts per can of 8½ quarts:

	Cents.
For stations between 17 and 23 miles from Boston	6
For stations between 23 and 36 miles from Boston	7
For stations between 36 and 56 miles from Boston	8
For stations between 56 and 76 miles from Boston	9

And 1 cent more for each additional 20 miles.

This discount includes not only the freight, but the expense of handling the milk and the contractors' profits. There are so many factors which affect the expense that the producer has no way of knowing exactly the cost of transportation alone. The cars are leased at a fixed rate by the year, and if a car is completely filled the cost of freight

per can is much less than when a car is only partly filled. Again, the contractors have ice houses at the largest shipping stations and furnish their own supplies in a large measure, reducing the cost of refrigeration to a minimum. The inability of the producers to ascertain the contractors' profits and the exact cost of transportation sometimes causes discontent.

We have alluded to the old-time method of settling for surplus milk by paying for its butter value and to the abandonment of this plan for another one. The change was brought about primarily by the influence of the producers' organization. When the producers complained of the old system, with its uncertainties and the opportunity for distrust, and asked for a uniform price for all milk whether surplus or not, the contractors replied in effect that they would take their chances if the price was cut 2 cents per can. This was allowed by the producers, and this 2 cents is now spoken of as a "carrying charge." For instance, the Boston price of milk for the summer of 1905 was 37½ cents per can. To get at the figure which the farmer received, deduct from this 37½ cents the 2 cents for the "carrying charge" and also the proper discount, as shown above. The contractors also asked that the producers exert themselves to bring about more even production, so that the supply would be more uniform in quantity and the contractors be saved the large loss incident to paying for surplus milk that must be made into butter. After much thought this plan has been devised: Each producer, at the beginning of each six months price period, states the amount he intends to produce during the coming six months. If the total of the amounts exceeds the probable demand, each producer is cut down pro rata. Then it is understood that the price agreed upon for the period shall apply to that rating, with a range of one-sixth in either direction, and that the farmer shall be paid 1 cent less for all his shipments for each additional one-sixth variation. To illustrate: If a farmer is expected to produce 300 cans in any month, he can drop to 250 or increase to 350 and get the full price (37½ cents less the two discounts), but if he falls below 250 or runs over 350 he gets 1 cent less for all the milk he ships. When the next limit is passed the price on all his shipments drops another cent.

CANS.

The cans most used in the Boston milk business are made to contain 8½ quarts. The fraction is added so that there will surely be 2 gallons when the cans become battered from hard usage. As Boston is the commercial center of New England, this style of can is generally used in the smaller cities and towns of this section, although the Providence, R. I., can contains 10 quarts. These 8½-quart cans are

convenient in loading a wagon or car, as the handle is on one side and one man can easily take two cans in each hand. They are also convenient for the small producer, who can ship milk to the city, although his dairy produces but one can. These cans go into the car as they leave the dairy and at the terminal are turned over to the city dealer; hence they are convenient also at the city end of the line for delivering to the small grocer or restaurant keeper, who may not care to handle more than a can or two. Occasionally one may see on a milk train or about the depot of some wholesaler a few of the New York 40-quart cans, which are used as carriers for milk for the contractors' own retail trade; but these cans are not popular among those who have to handle them after having been accustomed to the smaller cans. Some of the contractors are experimenting with a new-style can. It has somewhat the shape of the New York can, but has just 2½ times the capacity of the regular cans—21¼ quarts. It is not so heavy as the 40-quart can, is more easily cleaned than the 8½-quart can, and has a wider top. Some new cans recently adopted experimentally to a limited extent contain 8½ quarts, but have a concave bottom, so that all the milk that drains down the sides, after the cans are emptied, settles at the center of the bottom of the can. This makes washing easier, as there are no corners to cause trouble.

CAN STOPPERS.

For years the stoppers of the cans have been wooden plugs. These have the advantage of sealing the can perfectly, for a tap with a hammer drives the plug in so tightly that the can is almost hermetically sealed. If there is need of piling up the cans in tiers, or "stacking" them, these wooden plugs make a firm and level surface for sustaining the tier and are not injured by the added weight. The convenience of this kind of stopper and the fact that it is the kind used in Boston has led to its adoption all over New England in the milk business of the other cities and towns.

Modern knowledge of bacteriology and the effect of bacteria on milk, however, has shown the undesirability of such stoppers even when apparently clean. In time they became so battered and full of cracks that it is impossible to sterilize them. A stopper was taken from a shipping station where the stoppers were treated with steam so liberally that they had all the appearance of being fully sterilized. Any ordinary inspection would have passed it as being perfectly clean and dry. It was examined by the bacteriologist of the Dairy Division, who took scrapings from the end and from some of the cracks with a sharp knife, and from these made gelatin plates in the usual way. Although a dilution representing 0.0005 gram of wood was used, the plates were all liquefied by bacteria. This

indicated that the surface of the wood contained a large number of bacteria, the presence of which in milk would be undesirable. Another stopper taken from an empty can in a milk car was a fair sample of many of the stoppers that are returned every hot summer day to the farmers for their wives to wash. The bacteriologist reported the ends of this stopper and the cracks to be completely covered with mold. The mold was removed from the end of the stopper by scraping, but the cracks were so thoroughly impregnated with molds that no examination of them was attempted. A drop of the first dilution added to a flask of sterile milk curdled the milk in twenty-four hours, with digestion and gas formation. The gelatin plates gave the following results per gram of wood:

Bacteria digesting milk	2,760,000
Bacteria producing gassy fermentation	680,000
Remainder, mostly lactic-acid formers	52,240,000
Total	55,680,000

What happens to such stoppers in the hands of the farmer? They receive treatment varying with the disposition of the farmers and their wives. In some cases the outside of the stopper is washed in the ordinary way of washing any utensil; in others the stoppers, after being washed, are placed in boiling water. In one instance an unusually neat woman was found who placed the stoppers in a kettle of water and boiled them. A stopper was taken from a clean dairy which seemed to be well managed. This was believed to have been given a little more thorough treatment than the average—certainly no worse. The stopper appeared absolutely clean and was dry. Gelatin plates were prepared in the usual way and the count showed a total of 90,000 bacteria per gram of wood—that is, the end wood which would come in contact with the milk. This stopper had been "scalded" and was probably as clean as it was possible to make it with ordinary farm accommodations.

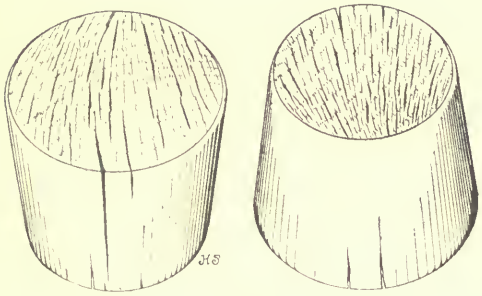

FIG. 2. Wooden plug used in the Boston milk can.

The board of health of the city of Holyoke, declaring that the wooden plugs are a source of filth and cause of sickness, has prohibited their use. The milk inspector of the city will not license persons to deal in milk unless this order is complied with.

Figure 2 illustrates the characteristic wooden plug, or stopper, for

the typical Boston 8½-quart can. The milk contractors or wholesalers supplying the Boston market, realizing the undesirabiltiy of these stoppers from the sanitary standpoint, have experimented with several forms of tin covers. They are more costly than the wooden plugs, and to prevent loss they are attached to the can by a short chain. These tin covers answer fairly well the purpose of presenting a level top for convenience in piling up, or stacking; but they meet with general disfavor by the trade. There is a depression in the top to hold the ring to which the chain is attached. This catches dirt, which eventually finds its way into the milk. Tin covers do not fit the cans so tightly and firmly as do wooden plugs, hence there is more or less trouble from leakage. To obviate this some handlers of cans try to make the tin covers hold better by driving them on with a hammer, as they do the wooden plugs. This operation results in cracking the tin, and these cracks harbor dirt and sour milk, and the conditions are sometimes as bad as where the wooden plugs are used. Furthermore, the covers dangling from chains are always in the way when emptying the cans. Tin covers with convex tops are impracticable in the case of 8½-quart cans, as they do not allow placing in stacks, or tiers. Such covers, however, are satisfactory on 40-quart cans. Some tin covers were found with a hole punched in the top and bottom to allow air to escape when placing the cover on the can.

A year ago one might truthfully have written that the trend in Boston was toward the tin covers. They have so failed to win favor in the trade that now sentiment is changing the other way and the wooden plug is again most favored by the peddlers of milk. To render the use of the plugs less objectionable, some of the dealers are using parchment paper between the wood and the milk. A small sheet is placed over the top of the can when it is filled with milk and then the plug is driven into place.

The newest thing in the Boston milk business is a recently invented machine for taking dents out of cans in a way that does not start the seams or crack the tinning. This device is of advantage from a sanitary standpoint, for it restores a smooth surface to the inside of the can, thus enabling it to be more readily cleaned. The machine is of advantage financially to large dealers, for it adds half a pint on an average to the capacity of each can.

WASHING CANS.

The cans used in the Boston milk business are usually washed at the farmers' homes. The empties are returned from the city without even being rinsed; and when the producer takes them from the railroad to his dairy, the washing frequently devolves on his wife or daughters, adding a considerable burden, while the work can not

always be done thoroughly. Whether or not the contractors should return clean cans to the producers is a question which has been discussed at the meetings of milk producers for many years. The contractors' side of the case has two points; the first is the expense. The contractors say that they are now obliged to keep about five cans for every can of milk shipped, to allow for the number going and coming to and from the country and for those held over by dealers and by farmers. As the empties received from the peddlers are loaded directly into the milk cars while the latter are standing at the milk stations for unloading, there is no time then for washing. In order to have them washed it would be necessary to retain them in the city twenty-four hours, thus necessitating another set of cans. The contractors claim that this would be an unnecessary and burdensome expense. They further claim that, no matter how clean a can may be washed in the city, it must be scalded and aired in the country before it is again fit to hold milk. They argue that if the farmers receive nicely cleaned cans they will be careless about the scalding and airing, and the milk will reach the city in much worse condition than it does at present. The farmers' side of the case is that washing cans belonging to the contractors is not a necessary incident of milk production; that the work can better be done on a large scale by machinery and with plenty of hot water and steam; that sometimes cans are returned in a repulsively dirty condition, and that cans which have stood for days in a restaurant or grocery store, possibly used as slop cans during that time, are in a condition that the farmer should not be called on to remedy. Judging from stories told at some producers' meetings, cans containing restaurant slops, kerosene oil, and decaying masses of sour curd are very common. It should be stated, however, that most of the cans are returned quite promptly after they are emptied. One large shipper told the writer that although he thought all cans should be returned clean, he had no trouble with those which are exceptionally bad; if he had one which contained what would not readily rinse off, he simply declined to use it and returned it to the contractors. A common sight about farmhouses, where milk production is a specialty, is a row of cans inverted on racks for airing after having been washed.

A third factor, which is now coming prominently to the front, is the work of medical men and boards of health. These are alert for the improvement of the milk supply and call attention to faults in the milk situation. Conditions which were once considered good enough are now regarded as intolerable, owing to the information which modern bacteriological investigations have made available. The contractors admit, by implication at least, that conditions which formerly existed were not perfect. They are now experimenting with different kinds of cans and making other changes and improve-

ments. For instance, with the can holding two and one-half times as much as the common 8½-quart can it is found that fewer are required in proportion to the business done, and that these can readily be washed and sterilized before being returned to the farmers. It is also found that the milk comes to the city in better condition in these cans, furnishing a selfish argument for a gradual change in the system of returning dirty cans to the farmers.

In September, 1905, the producers agreed to take one-half cent less per can if the contractors should return clean cans to them.

CONDITIONS AT THE FARMS.

Boston has no system of certified milk, and none of the large contractors make a specialty of milk of extra quality at extra prices; but several large producers who can control all the conditions of production sell milk above the average in percentage of fat and also in cleanliness, receiving an adequate price for such quality. Neither has Boston any large firm of wholesalers who can and will make exacting regulations. Still, the Boston contractors are watchful over their supply, and have a system of inspecting stables and of cautioning producers when bad conditions are found. The contractors do some educational work also in giving instructions as to the proper manner of caring for milk, especially as to the importance of promptly removing it from the stable and cooling to at least 50° F., as the first half hour in the life of the milk is the most critical. The contractors require the producers to have an ice supply, and in one instance a contractor gave each of his producers a thermometer. At meetings of boards of health the carelessness of the farmers in the care of the milk is a matter of emphatic criticism with much of truth in the statements, especially in view of the increasing information as to the way in which milk should be handled; but, on the other hand, there are many intelligent, conscientious farmers who are painstaking and who produce a clean article.

Further attention is given this subject under the heading "Official inspection" (pp. 29–31).

CARRYING MILK FROM FARM TO CARS.

The first step in the transportation of milk is from the farm to the railroad station. This work is usually done by the farmer. There are no wagons for transporting milk from farm to cars that are constructed with the special idea of keeping the milk cool in summer and from freezing in the winter. Every conceivable kind of vehicle is used, from top carriages to very rickety wagons. In two instances the writer has seen wheelbarrows used. Often it is the daily duty of

the farmer's boy to drive the load of milk to the railroad, and sometimes the wife or daughter does this work. Average dairies produce from fifteen to twenty cans per day, which is not a large load.

When the milk leaves the farm it is supposed to have been cooled down to about 50° F., the exception being morning's milk produced near the railroad, which is taken at once to the car. When placed on the wagon for transportation to the station, it is carefully covered with a horse blanket or piece of canvas. When the drive is a long one a cake of ice may be placed under the cover in the summer or a lighted lantern in the winter. The average length of haul where the farmer carries his own product to the railroad is 3 or 4 miles. Where the production is small and the producers live greater distances from the cars, one farmer frequently collects the milk for a number of his neighbors. The customary charge for such collection is 2 cents per can, although in some cases as high as 3 cents is paid if the route is a long one.

When milk is taken to the station by a collector, although the affair has the semblance of a cooperative venture, the contractors exercise a supervision or control over the collection for the purpose of insuring reliable, punctual service, and warranting the collector enough permanent business to pay him for his labor and investment. He must have a strong wagon and good horses. As he must usually travel about 15 miles a day, in all kinds of weather, seven days per week, and on all conditions of roads, he can not do much other work, and so he must be sure of getting enough from hauling the milk to pay him for keeping a team exclusively for this business. Furthermore, he must be a reliable man, who will surmount obstacles and be on time with his load, regardless of storms and bad roads. Sometimes the haul by wagons is as long as 10 miles, making 20 miles of travel for the round trip. At one railroad station the writer met a driver with load of 94 cans. In the flush season the number is twice as large. He said that he collected from 32 dairies, which at that time were producing from 2 to 11 cans each per day. He lived 4 miles from the station, but had to drive 9 miles to take in all his dairies, making his daily trip about 13 miles. The milk leaves the farm at 6 or 7 o'clock in the morning, according to distance from station and from Boston. Where the start is much earlier, the milk of that morning is usually not taken.

The temperature of the milk when it arrives at the railroad station is of some interest. The writer took the temperature of a number of lots of milk received at Barre Plains and Old Furnace, Mass., when the air temperature was 75° F., and found that it ranged from 62° to 68°. One firm of contractors goes to the trouble of having the temperature of the milk from each dairy taken (morning and evening) by its agent at the railroad station, and the record sent to the city along with the milk. Regular blanks are prepared on which the

number of the dairy is entered and against it the two temperatures. The following is the temperature record of the milk put on the car at Canaan, N. H., on the morning of August 17, 1904:

° F.	° F.	° F.	° F.	° F.
54	54	56	52	58
56	56	54	54	56
58	56	58	58	46
46	54	56	58	56
54	56	52	54	52
44	44	48	48	54
52	56	54	54	52

That morning's shipment from Fremont, N. H., was of the following temperatures:

° F.	° F.	F.	° F.	° F.
58	54	54	56	56
56	50	50	54	54
56	51	51	58	58
58	58	59	58	56
54	56	58	58	50
58	56	50	58	58
58	.....	.....	.....	.....

The temperatures of the shipments from Barrington were as follows:

° F.	F.	° F.	° F.	F.	° F.
69	57	62	62	64	63
63	58	58	48	48	56
51	44	58	58	53	56
48	62	45	64	74	52
50	67	58	52	72	.....
54	64	64	50	66	.....
57	50	.....	48	60	.....

HANDLING AT THE RAILROAD STATION.

Most lines of railroad over which milk is transported have at each station a raised platform near the track and level with the car door. This platform is of varying size; perhaps 20 feet square is a fair average. In some cases a roof is built over it for the protection of men and milk. The farmers reach the station a few minutes before the train is due and unload the milk on the platform, or on the ground near where the train will stop when there is no platform. In all cases the farmers load the milk into the cars. In some few cases the arrangement of tracks and sidings is such that the milk has to be lifted from the ground and carried across one or more tracks. The milk seldom waits long at the station. It arrives just before the train, is quickly transferred from the farmer's wagon to the railroad car.

and does not have opportunity to be much affected by the weather if it started all right as to temperature and was properly covered in transit.

Ordinarily when the farmers take the milk to the car they get the empty cans to carry home for the next day's supply. Sometimes these are thrown from the train to the platform or ground the previous afternoon, when the milk car or train is making its outward run. Sometimes they are unloaded on the inward run, in the morning, before loading the full cans; then again, the empties are thrown from one door while the milk is loading into the other. Frequently the empty cans are tied in bunches so that a half dozen can be handled with one throw. These empty cans are, as a rule, unwashed, and on the farmer's return to his home, cleaning the cans is the first duty of those who do the work of the dairy.

MILK CARS.

Most of the milk shipped to the Boston market is transported in cars built especially for the business, which are peculiar to Boston. A small amount of milk is shipped by express on passenger trains; some of this is for hospitals from selected dairies, and some is for small peddlers who buy direct from the producers. A further small amount is thus shipped from fancy dairies to some agent for distribution direct to customers who pay an extra price. A small amount of milk also comes into the city in refrigerator cars on fast freight trains, and a small amount is loaded into baggage cars on branch lines for reloading into the regular milk car at the junction point. But, speaking in a general way, practically all of the regular supply is transported in the regulation milk cars, which are much alike on all the roads. The cars appear superficially much like common express cars, except that each one has a small window or two between the two side doors, and has the word "Milk" painted upon it. Occasionally one sees a car with a narrow door in the middle instead of a window. The cars have the usual end doors for the convenience of trainmen. Most of the milk cars are 48 feet long, inside measurement. In the center is an office, usually 8½ by 9 feet. The office has two windows on each side, except in a few cases where there is a door. Each car has eight closets. These are 3⅞ by 4 feet, and with two shelves, accommodating three tiers of cans. Each tier has 30 cans, and thus each closet holds 90 cans. This makes a closet capacity per car of 720 cans. There are two doors, 3½ feet wide, opening to a space in each end of the car for receiving the cans, storing and breaking ice, and doing the necessary work of handling cans. When the closets are full, some cans are placed on the open floor space. Nine hundred and sixty cans is the usual carload.

There are some minor differences as to detail in different cars. For instance, on some roads the milk cupboards hold 105 cans each and the carload is 1,000 cans, or 8,500 quarts. But in a general way one car is a fair type of all of them. Years ago the railroads paid but little attention to the amount of milk carried in a car. The car was leased to the contractor, and no questions were asked as to the load that he put into it. More recently there has been a disposition to keep a supervision over the amount shipped. Formerly as high as 1,400 cans were sometimes placed in a car without any fault being found. Now the roads require daily reports from station agents as to the amount loaded at their several stations each morning. If the load exceeds 960 or 1,000 cans (according to the road), the contractor is compelled to pay for an extra car. The contractors pay by the year for the cars, on varying plans, which makes it difficult to get at the exact cost of transportation. Further than this, a car starting 50 miles from the city may run a quarter full a third of the way, half full a third of the distance, and completely full the last third of the trip, thus increasing the difficulty of computing the cost of transportation. If the contractor could put in 200 or 300 additional cans for a portion of the distance in time of flush production, it would be an advantage to him, but would greatly decrease the possibility of estimating accurately the cost of transportation.

The contractors plan to have an ice house, when possible, at the village from which the car starts and located near the tracks. They fill this themselves and hence have a handy supply of ice at cost. When the car starts it has from 2 to 4 tons of ice, according to the length of run. The smaller amount is the more common. At a station where milk is received, it is loaded by the farmers into the open spaces at each end of the car, and on the run between stations the carmen (in the employ of the contractors) are kept busy packing these cans into the cupboards or closets, and, in the summer, breaking up the large cakes of ice and shoveling the pieces onto the cans and working it into the vacant spaces. When one of these closets is full the door is closed and kept so until the car reaches the city. In addition to the trainmen (two to each car) employed by the milk contractors, the railroad company sometimes has a special trainman besides those on duty in the passenger cars. The milk cars are piped for steam heat in winter.

FREIGHT RATES.

The Massachusetts statutes require that all freight rates shall be fair and proportionate, and that all shippers shall have equal advantages, and the law gives the railroad commissioners full power to fix rates for transporting milk. In practice this applies only to small shipments, for the large contractors are always able to reach some

agreement with the railroads on car lots, and never appeal to the commissioners; but there have been a number of interesting appeals to the latter by smaller shippers, their complaint being that discrimination was shown in favor of the large wholesale shippers by the system of leasing cars, and that the small shipper could not get milk iced in transit. The commissioners decided that it would be unjust to compel a railroad to run a fully equipped separate milk car to give a shipper of 20 cans per day as good accommodations as the shipper of 1,000 cans, but ordered some arrangement to be made between the railroad and the contractor by which the milk of the small shipper could go in the contractor's milk car. As a result, at a few stations milk tickets were sold by the railroad to the producer. These were received by the contractor with the understanding that the milk would be transported and properly cared for in his car. But the rate was considered too high and complaint was made to the commission, which entered into a careful computation of what might be assumed to be the cost to the contractors of transporting milk in car lots. To this was added a sum which the commission considered a fair and just increase for retail transportation, and ordered that this sum should be the retail rate for shipping milk. Then the milk producers asked for a retail rate from every station from which milk was shipped. This was opposed on the ground that the commission had no right to rule on hypothetical cases and could fix rates only where there was milk to be shipped. But the commission overruled this, and made rates as requested by the producers. Very little practical use, however, has been made of these rates.

It should be understood that all this applies only to shipments originating in the State. Much of the milk coming to Boston is the subject of interstate commerce and under the jurisdiction of the Interstate Commerce Commission in case of dispute, rather than the State commission.

MILK ROUTES.

Forty-five to fifty milk cars, such as those already described, reach Boston every day. They are largely attached to passenger trains which run as slow accommodation trains and are popularly known as "milk trains," although they are on the regular time tables as ordinary passenger trains. In two instances the milk cars are run in special and exclusive trains. The cars leave the country terminals in time to reach the city soon after 10 o'clock a. m. In a general way it would be accurate to say that the cars start about 5 or 6 o'clock in the morning and are four or five hours on the road, but in some cases the cars start as late as 7 o'clock. The trains stop to pick up milk at stations along the road until they get within three-quarters of

an hour to an hour of the city, so that milk is collected until 9 o'clock on some routes. Why the cars are run at this time instead of running in the night we do not know.

The milk car, as a rule, brings to the city the milk of that morning and the previous night; but when the train leaves too early to make this convenient, or when the collector has to call too early in order to connect with the train, the milk of the previous day is shipped and the milk of that morning is held over. The aim in the Boston method of handling milk seems to be thorough icing rather than rushing it through to the consumer in the shortest possible time.

Some of the contractors have butter factories and cheese factories in the country entirely separate from their milk business, but giving them control of extra milk for an emergency. Each of the contractors except one has a station on his route where any surplus can be left and where milk from the longer runs can be iced and left overnight, and from which extra milk can be taken in anticipation of an unusual demand. One collecting firm has two shipping stations patterned after the New York system, at which milk is received from the farmers in the latter's cans, clean cans returned, and milk paid for by weight. Here the milk is aerated, mixed, cooled, and canned.

A notable exception to the system of running cars exists in the case of a milk car which leaves Gorham, Me., at 8 in the morning and reaches Rochester, N. H., too late to get into Boston in time for the usual sales; it remains in Rochester six hours and goes to the city on a fast freight in the night. Another exceptional car leaves Willimantic, Conn., at 3 p. m., and reaches Boston at 6, remaining on the track overnight for the early morning trade.

A ROUTE IN DETAIL.

The station at Northampton, Mass., is the starting place; time, 5.50 in the morning. The train consists of a combination baggage car and smoker, a common passenger car, and a milk car with a few cans of cream and milk that came down from Keene, N. H., the previous afternoon. In fourteen minutes we stop at Amherst to take on 20 cans of milk, and to leave a cake of ice and a few empty cans. In eight minutes more the train draws up at a flag station where 15 cans are loaded from the station platform and several empties thrown out. The next stop is at Belchertown. Here eight one-horse wagons are hitched promiscuously to all kinds of available objects about the station; and 120 cans of milk are loaded, while the passengers are increased by one. Two or three miles farther on the train draws up at a highway crossing where there is a small platform and the usual shelter. Here nine single teams with common wagons are hitched to near-by fences and bushes, while the farmers quickly transfer 150

cans of milk from the platform to the car. Among the drivers of the teams are three girls. It is now 6.35 and we have reached Bondville, where there is a repetition of the scenes at the previous station and about the same amount of milk loaded. The farmers have loaded the empty cans before the train arrived and some begin to drive away before the train leaves, reading their morning papers as their horses jog slowly along.

Some 4 miles farther along we come to another crossing where a dozen teams are hitched by the roadside. Here 175 cans are transferred from the shed to the train by the farmers, while the same number of empties, tied in bunches of 10 each, are thrown from the other door of the car. This not being a regular stopping place for the trains other than this milk train, these empty cans were not left here the afternoon before. Just as the conductor is raising his hand to signal to start, a belated producer hurries his team to the platform, and has just time enough to put 8 cans (his day's product) on the train before it gets under headway. At Ware, an hour from Northampton, we come to a manufacturing village, where there are more evidences of life and a few passengers board the train. Though there are no signs of milk production in the foreground, 100 cans of milk from near-by territory are taken on the train. At Gilbertville, about 4 miles beyond, one of the largest collections of farm wagons yet seen is grouped about the station and the milk on the train is increased by 200 cans.

As the train has been moving on, the men on the car have had all the work they could do between the stations in stowing the cans into the closets and packing broken ice about them. The little rooms have been filled and some cans have been stacked on the floor of the car with boards between the tiers of cans, while broken ice has been packed about them. The car is full.

At New Braintree only a few milk wagons are in sight, and these are for the most part headed for home. This is accounted for by the fact that they have loaded their day's supply in a car which is standing on a siding. Our train backs up to this car and is coupled to it. The next station is Barre Plains, but the train takes no milk here. This is a junction and the shipments go to the city by another line, controlled by another contractor. It is now 8.30 and we are at Barre. About 50 cans are loaded at this station. As many more are put on the train at Colebrook. The section of country through which we are passing, including Barre, New Braintree, and contiguous towns, has the reputation of shipping more milk over the two lines than any area of similar size supplying the Boston market. At West Rutland there is a repetition of scenes already reported—the characteristic milk platform and shelter, the group of wagons, and the loading of the cans. Here is noticed the first two-horse team

seen on this ride. At this station is seen another belated farmer who barely gets his 7 cans of milk on the train before it starts. At Rutland 61 cans are loaded, and 2 are set off bearing a pink slip held in place by the wooden stopper. This slip reads: "Sour—Returned." Each dairy has a number; these numbers are printed on gummed paper and supplied to the farmers, who are required to keep one glued to each wooden stopper. In this way the car men can keep track of the shipments from each dairy and correctly report the amount of milk. When sour milk is returned, the number on the can shows from what dairy it was taken.

It may be remarked that this return of sour milk is a cause of much dissatisfaction on the part of the farmers, who claim that when the milk is delivered at the station to the agent of the contractor their responsibility should cease. The contractors claim that milk should be delivered to them in good condition, but that the nature of milk is such that its condition can be determined only by premature souring; and that if a can or two of milk sours sooner than other milk kept under similar conditions that fact is proof of its having been originally delivered in an improper condition. The farmers retort that, even if the contractors' statement of an abstract proposition is correct, the concrete application makes the contractor prosecutor, judge, and jury, and gives the farmer no opportunity to satisfy himself of the correctness of the facts.

Nine o'clock, and Muschopauge station is reached and 17 cans loaded and 4 with the pink slips set off. Five miles beyond, at Quinapoxet, 60 cans are loaded and 1 can of sour milk set off. Oakdale is reached at 9.30. Here a two-horse team having 60 cans is driven alongside of the car and unloaded directly into the car, while about 20 cans are picked up from the station platform. At Berlin a dozen cans are added to our load, 17 at Hudson, 10 at Wayside Inn, and half a dozen at South Sudbury, which ends the taking on. This place is only 20 miles from Boston and is reached at 10.22.

At Waltham, 10 miles from the city, 10 cans are left for some local dealer. At Cambridge three wagons are backed up to a milk shed and between 250 and 300 cans are unloaded, while a few pink-slip cans are placed on the car to go back into the country in the afternoon. A mile farther, and just before entering the passenger station, the train stops and the milk cars are disconnected. We move on to the station, while a switching engine takes the milk cars to one of the milk-receiving stations. The run of 105 miles has been made in five hours and twenty minutes.

ANOTHER MILK ROUTE.

This is a different kind of route, and the ride over a portion of it may be described as follows: We reach the station of the rail-

road at Wilton, N. H., about 7.30 a. m. A milk car is on the siding and a procession of teams stands in line, each farmer waiting his turn to reach the car door and unload his daily product into the car. The longest drive for a farmer is about 6 miles, and many farmers live within 2 miles of the railroad. About 300 cans are daily loaded here. This car has closets that hold 90 cans each, 30 on each shelf, and it takes a supply of ice amounting to 4 tons each day. For twenty minutes the work of loading proceeds, when a locomotive whistle is heard in the distance, and at 7.55 a train appears, composed of two milk cars and one ice car. One of the milk cars is from Peterboro and one from Hillsboro. The Wilton car is connected, giving the train a third milk car. After a run of a few miles we stop, and 120 cans are loaded. The same thing happens at Milford, and small supplies are taken at several minor stations. Nashua is the next stop, and here a whole carload of milk from Henniker is attached to our train. It is a short run to Lowell, Mass., and just before reaching it a stop is made and two more cars are picked up—one from Sterling, Mass., and one from Hollis, N. H. The train with its six cars runs as an express to Boston and is promptly switched around to the milk depot of one of the largest contractors, reaching there about 10.15 a. m.

The man in charge of the train is an agent of the contracting corporation, who receives reports from each carman en route. He is kept busy with his accounts, and has them classified and ready to turn over to the clerical force in the Boston office as soon as the car arrives.

The milk on this train is all of the evening before and that morning. The evening's milk is all carefully cooled, but most of the morning's milk is produced so near the railroad that the management of the milk company believes it suffers no harm during the few moments it is on the way from the dairy to the car, where it is carefully packed in ice.

THE MILK IN THE CITY.

AT THE RAILWAY STATION.

When the milk reaches the city most of it passes immediately into the hands of the peddlers, or retailers, who are to distribute it. Many of these are at the platform on the arrival of the train to take their supply as soon as it comes out of the cars. Some peddlers take milk from the same dairies, so far as it is possible, day after day. They take the milk in the cans in which it was transported, so that the milk goes in the same cans from producer to peddler. For an hour or so the city milk depots are scenes of great animation

as the cars are unloaded and the empty cans transferred from platform to car. As soon as this work is done the cars are hauled out ready to be made up into their respective trains for return to the country. When the peddlers leave the milk station with their loads of milk, they go for the most part to their several places of business, where the milk is poured into mixers to make it uniform in quality and then bottled for delivery to customers. These bottles of milk are then put on ice to be kept until early the next morning, when the milk is distributed, often before people are awake, the bottles being left on doorstep or in some other convenient place. Where dealers have customers who take whole cans—like hotels, restaurants, stores, etc.—these may be delivered in the early afternoon of the day they are taken from the car. Hence it is sometimes possible in an afternoon to buy milk at a grocery which is fresher than the regular family supply. The family supply could be delivered the day before if it were not for the feeling among housekeepers that morning is the time for milk to be delivered. If an afternoon delivery would be tolerated, much milk could be delivered the day it is produced.

Each contractor's milk-receiving station is fitted up with sheds and platforms adjoining the railway tracks. It has, in addition, commodious and up-to-date buildings for offices, vats for holding surplus milk or for carrying milk over for another day's use, also a complete butter-manufacturing outfit for utilizing any surplus milk, and in one instance a cheese plant.

THE PEDDLERS.

The places of the milk peddlers were in many instances very filthy and insanitary. The stables and the milk room were frequently close to each other, and, besides this, there had been general untidiness. With increasing knowledge of the effect of such insanitary conditions, the health authorities have become more active and vigilant, and this has resulted in great improvement in the condition of milk "stables" and milk houses.

Many retail milk routes are falling into the hands of the contractors. This sometimes happens through the necessity of taking them in payment for debts, and sometimes through a policy on the part of some of the contractors to control the retail trade and to eliminate the second set of middlemen. Some of the contractors do both a retail and wholesale business in the same corporate name, while others take a different name for the retail part of the business. In some instances a contractor selects some of his best milk for his own retail trade; then, by pasteurizing or filtering it, he can place on the market an article of more than average quality. Where this

is done the contractor's milk depot contains more machinery and other equipment than is usually the case.

DESCRIPTION OF A CONTRACTOR'S RETAIL DEPARTMENT.

On the arrival of the milk train in Boston a large can (a mixer) is placed in the car, and connected by hand couplings and a short piece of pipe with what might be described as a hydrant in the platform. The milk is emptied from the milk cans in the car into this mixer. When a can is emptied it is placed bottom side up on a rotary rack inside of the mixer to drain. The rotary rack holds about a dozen cans, and by the time it is full the can first put in is well drained and is taken out and returned to the car, while another empty is placed in position, so that for every can taken out another is put in till the car is emptied. The milk is pumped from this mixer to a cooler in the upper story, where it is run over pipes filled with ice water. From this it runs to a strainer. This strainer is a tank with wire bars across the bottom. Cheesecloth is placed on these and absorbent cotton on top of this, then another layer of cheesecloth. This is followed by still more wire bars to hold the cloth and cotton in position. When this strainer has been in use for some time another is substituted, the cotton being stained quite dark with the manure and other filth which have been taken from the milk. The word "strainer" is used because that conforms more strictly to the language common in the dairy, but this apparatus may more accurately be termed a filter. From the strainer, or filter, the milk flows to a glass-lined tank containing 2,200 gallons. There are two of these tanks in the room. The milk in these tanks is continually stirred by an agitator, resulting in a perfectly uniform article. The room has an asphalt floor and the wooden walls are covered with enamel paint, so that the premises can be kept scrupulously clean. From these tanks the milk flows to fillers in the room below, from which glass bottles or tin cans of various sizes are filled for the next day's trade. The milk averages 12.75 per cent solids—3.80 per cent fat. The glass milk bottles are put into boxes and broken ice is packed about them. The pipes through which the milk is conveyed are made of tin-lined copper and are kept scrupulously clean. After the day's work is done they are filled with water and sal-soda, which is allowed to stand for a while; then they are flushed with clean water, and steam is driven through them. They are put together with "unions," so that every part is readily accessible. The place has up-to-date accommodations for washing and rinsing cans and for cleaning and sterilizing bottles. A large business in modified milk for babies and invalids is also carried on.

One of the large Boston dealers who puts on the market a superior quality of milk publishes a booklet in the Italian and Hebrew languages, as well as in English, descriptive of his methods and advertising the product.

CREAM.

The cream trade in Boston is supplied to some extent by the milk contractors, their supplies being received from skimming stations in the country and transported in their milk cars; but they do not have such exclusive control of the cream business as they do of the milk trade. A number of creameries are making a specialty of cream production and are sending considerable quantities to the city by express. One large Maine corporation has two creameries in that State where milk is received, pasteurized, and separated, the cream being shipped to several of the larger New England cities. The milk is collected by railroad for these creameries, carefully iced in summer, and shipped in charge of men on each car. The cream for Boston leaves the creamery at 5 p. m. and is forwarded by fast freight in refrigerator cars. It reaches Boston at 6 o'clock in the morning. It is carried in 40-quart cans, covered with a flat tin cover made perfectly tight by a rubber collar. The cover is fastened firmly in place by a little clamp. It is sealed with a lead seal similar to that used on the doors of freight cars. This prevents any tampering with the cream in transit. When the cream reaches the city it is hauled on drays to the company's depot, where it is put into small glass cans, or jars, for retail trade, and teams are dispatched to the grocers in all of the city and suburban territory. This trade from the Boston office runs as high as 1,800 gallons per day in the hottest summer weather, and will average about 1,000 gallons per day the year round. Incidental to the cream business, about 100 of the usual $8\frac{1}{2}$-quart Boston cans of milk are sold. The milk mostly comes as pasteurized skim milk, and enough cream is added to give it the proper quality. The Maine cream is of two qualities—44 per cent and 17 per cent fat. Some of the cream is sent by railroad to Portland and reshipped on the Portland and Boston boat, which arrives a couple of hours earlier than the train. Such cream as comes by boat is in the usual carriers, and these are packed in broken ice in wooden boxes, which are made large enough to hold a can each.

OFFICIAL INSPECTION AND REGULATIONS.

An unusual amount of attention is paid to the sanitary side of the Boston milk supply. The Massachusetts Board of Health is making an inspection of the dairies supplying the city with milk. A competent veterinarian is employed to take charge of this work. The fol-

lowing shows the form of blank used for reports and the particular matters which he investigates:

COMMONWEALTH OF MASSACHUSETTS.

STATE BOARD OF HEALTH.

Inspection of dairies.

City or town ——— ———. Date ——, 190—.
Name of owner ——— ———. Time of visit —— m.
Number of cows ———. Number of cow stables ———.
Condition of cows (1) as to health ——— (if any are sick, note same on reverse side of blank); (2) as to cleanliness.

Condition of cow stables:
Construction ———. Approximate cubic space per cow ———.
Means of ventilation ———. Condition as to light ———.
Nature of floor of cow stalls ———. Means of drainage ———.
Are the cows bedded? ———. If so, with what? ———.
Where is manure stored? ———. How often removed? ———.
Is hay stored where cows are kept? ———. Are horses kept in same stable? ———.
General condition as to cleanliness ———.

Water supply:
Source of supply (a) for watering stock ———; (b) for washing cans, etc. ———.
Distance of latter from (a) stable ———; (b) possible source of pollution ———.
Direction of ground level from each such source ———.

Milk:
Are the udders cleaned before milking? ———. If so, how? ———.
How is the milk cooled? ———.
Where is it cooled and handled? ———. Where is it stored? ———.
Where are cans, etc., washed? ———. Where kept during milking? ———.
Has the owner an ice house? ———. Is ice easily obtainable in the vicinity? ———.
How much milk is sold? ———. To whom is it shipped? ———.
How far is it hauled for delivery? ———. At what hours is it hauled? ———.
If delivered at a railway station, how long a time is likely to elapse before it is taken into the car? ———.

Signature: ——— ———.
Inspector.

[Reverse side.]

Memoranda as to diseased cows.

Name or number of cow. Condition.

Remarks:

Not only is the State board of health making investigations, but the city board also does inspection work, particularly along bacteriological lines.

On April 29, 1904, the following regulation in regard to the milk supply was adopted by the Boston board of health:

> No person by himself or by his servant or agent, or as the servant or agent of any other person, firm, or corporation, shall bring into the city of Boston for the purpose of sale, exchange, or delivery, or sell, exchange, or deliver, any milk, skimmed milk, or cream which contains more than 500,000 bacteria per cubic centimeter, or which has a temperature higher than 50° F.

During June, July, August, and September 2,394 samples were taken and tested. Most of these were taken from the milk as it arrived in the city. The results were as follows:

	Per cent.
Between 30° and 40° F.	4.00
Between 40° and 50° F.	49.25
Between 50° and 60° F.	39.50
Between 60° and 70° F.	7.25
	100.00
Below 50° F. (the standard for temperature)	53.25
Above 50° F. (the standard for temperature)	46.75
	100.00
Below 10,000 bacteria per cubic centimeter	42.50
Between 100,000 and 500,000	29.25
Between 500,000 and 1,000,000	9.75
Between 1,000,000 and 5,000,000	12.75
Above 5,000,000	5.00
Uncountable	.75
	100.00
Below 500,000 (the maximum allowed)	71.75
Above 500,000 (the maximum allowed)	27.50
	99.25

During the first season of this work the board sent out about four hundred warnings where the milk varied from the standard. In many instances good results were quickly noticeable.

PART II. THE MILK SUPPLY OF NEW YORK CITY.

EXPLANATION OF TERMS.

"Greater New York" is now by law one municipality; hence when the expression "New York" is used it means Greater New York.

The New York milk supply is handled to a large extent in 40-quart cans; therefore the word "can" in connection with the New York milk business means 40 quarts. The milk is hauled by the farmers to milk stations near the railroad stations from which it is shipped, and these shipping stations are locally known as creameries; hence the word "creamery," in connection with the milk supply of New York City, does not mean a butter factory, as in other places, but a place where milk is received from the farmers and prepared for transportation to the city.

MAGNITUDE OF THE BUSINESS.

New York City, with three and a half million people credited to it by the census (1900), and with a large transient population such as every metropolis attracts, consumes daily an immense amount of milk. To estimate the magnitude of the business presents some difficulties peculiar to local conditions. For example, one of the largest firms supplying the city with milk is also one of the largest condensers of milk in the country, and it is very conservative about making reports relative to its business; and so far as reports are made to the State agricultural department of milk received in the country, the figures represent milk received by it for condensing as well as for sale as whole milk. Further than this, the cream business of New York City is largely in the same hands as the milk business, and some official reports refer to the amount of "milk and cream" shipped, whereas, to get at the magnitude of the milk industry alone, we must put the cream on the basis of milk.

Let the question be considered from the theoretical standpoint: Averaging many reports and estimates, we find that the average consumption of milk exceeds half a pint per capita per day. This figure indicates the daily consumption of three and a half million people to be 875,000 quarts of milk, not including cream. Should we add one-tenth of a pint per day (allowance for cream) to the usual daily milk consumption per capita and use six-tenths of a pint as a

multiplier, the product would be 1,050,000 quarts per day. These estimates are based on the ruling daily consumption of milk and cream in smaller places, which have not the large transient population of New York.

Taking the best statistics which we can find, we note that Bulletin No. 25, Division of Statistics, United States Department of Agriculture (p. 13) estimates the New York "milk and cream" supply at 400,000,000 quarts per year, which is 1,093,162 quarts per day. The same bulletin (p. 22) quotes the compilation of a railroad freight agent, who figures up the receipts of milk and cream for 1902 as 428,000,000 quarts. This would be 1,175,300 quarts per day. The State department of agriculture in Bulletin No. 6 (p. 2) reports the amount of milk shipped from stations in the State for the year 1902 as 383,000,000 quarts, with an additional 15,000,000 quarts of cream, these shipments thus aggregating 398,000,000 quarts of milk and cream per year, or 1,087,670 quarts per day. These figures from the State report should be reduced by the amounts shipped to other places than New York City and increased by the amount sent from outside of the State to the metropolis. The New York City department of health, in its report for 1902 (p. 144), states: "The amount of milk consumed in New York [City] is somewhat less than a million and a half quarts daily." Health Commissioner Darlington estimates the consumption of milk in January, 1905, at 1,388,000 quarts daily, as follows:

Manhattan	800,000
Brooklyn	400,000
Bronx	90,000
Queens	80,000
Richmond	18,000

There are no great discrepancies between these various estimates and reports. It is safe to infer that if the cream consumed were put on the basis of milk the industry would be shown to amount to over 1,500,000 quarts daily. If the cows which produce this supply of milk average 7½ quarts daily, over 200,000 cows would be required.

WHERE THE MILK COMES FROM.

Health Commissioner Darlington estimates that 87 per cent of the milk and cream consumed in New York City is produced in the State of New York. This milk comes from distances varying from 40 to 400 miles. The balance of the supply comes from northern New Jersey, northeastern Pennsylvania, western Connecticut, and southwestern Massachusetts.

In regard to the 87 per cent of milk from the State, this may be said as to its origin: The New York City health department esti-

mates that 400 creameries ship milk to the city. The previously mentioned bulletin of the State department of agriculture lists 539 milk stations in the State. This list includes those shipping milk to other cities, but does not include those out of the State which send milk to New York. But an analysis of the location of the 539 milk stations in the State will indicate the relative milk-shipping importance of different counties. The following table gives the number of shipping stations in the thirteen leading counties, as well as their relative rank:

Rank.	County.	Stations.	Rank.	County.	Stations.
1	Orange	71	7	Sullivan	24
2	Delaware	52	8	Broome	20
3	Madison	40	9	Cayuga	17
4	Chenango	30		Herkimer	17
5	Dutchess	27	10	Tioga	16
	Oneida	27		Chemung	16
6	Cortland	25			

The following table gives the relative order of the leading counties, based on the amount of milk reported as received at the shipping stations, or creameries, in the counties:

Rank.	County.	Cans received.
1	Orange	86,000,000
2	Delaware	67,000,000
3	Madison	44,000,000
4	Chenango	43,000,000
	Dutchess	43,000,000
5	Cortland	30,000,000
6	Herkimer	21,000,000
	Oneida	21,000,000

Both standards agree in placing Orange County first, Delaware second, Madison third, Chenango fourth, and Dutchess fifth. Beyond these the two standards show some variation.

LARGE DEALERS.

Most of the milk sold in New York City is distributed and retailed by dealers who own the shipping stations in the country, and who are therefore receivers, wholesalers, and retailers, all in one concern. Some tables follow which give some idea of the amount of business done by some of the largest dealers. These tables have been prepared by analyzing and classifying reports of the State department of agriculture. The first column relates to the number of shipping

stations: the second column gives the number of quarts received at each of the stations in 1902:

Number of shipping stations.	Number of quarts.	Number of shipping stations.	Number of quarts.
1	14,000,000	5	5,000,000
3	10,000,000	3	4,000,000
1	9,000,000	10	3,000,000
1	8,000,000	21	2,000,000
1	7,000,000	122	1,000,000
1	6,000,000		

The following table shows the number of stations owned by some of the largest dealers, using letters instead of names:

Corporation.	Number of shipping stations.	Corporation.	Number of shipping stations.
A	27	F	8
B	26	G	5
C	25	H	5
D	23	I	8
E	10	J	6

These ten concerns have 143 stations—or one-quarter of the whole number; besides, there are two establishments with 4 stations each, six with 3 stations each, and eight with 2 stations each. There are some difficulties in getting at all the figures, but from the best estimates we can make it appears that five of the largest concerns handle one-third of all the business.

COMMENTS OF DEALERS AND PRODUCERS.

One of the largest dealers said: "There is a growing sentiment in favor of the large corporations, because the larger they become the more reputation and capital they have at stake, and hence the more reason for being reliable." Another dealer said: "The tendency is toward concentration: the small shipper is a thing of the past." A large producer stated: "The day of small peddlers who buy direct of the producers has gone by." One who is good authority made this statement: "The milk business appears to be getting into fewer hands. Probably 80 to 90 per cent of the milk sold in Greater New York is handled by 125 dealers."

MILK ON THE FARMS.

Several influences operate to increase the care with which milk is produced. In the first place, a premium is paid for superior milk in

many instances. Milk produced from healthy cattle under approved sanitary conditions is certified to by an association of physicians, and certified milk commands an extra price. It is produced in airy, well-ventilated barns. The milk as soon as drawn is at once removed and cooled to 38° F. and in that condition sent to market. Such milk never exceeds 5,000 bacteria per cubic centimeter, and frequently it runs as low as 1,500. In the next place, the concentration of the business in large and strong hands tends to raise the quality of the milk, and these corporations frequently have a reputation among the producers of being exacting and arbitrary. If these large concerns are particular as to the care of the milk at the dairy, they not only directly influence the quality of the milk which they receive, but they set the pace, as it were, for other dealers to follow. The largest firm supplying the city market happens to be the most particular, as much of its supply is condensed. The regulations of this corporation go so far as to prohibit the use of foods some of which have the sanction of the best dairy authorities. The list of prohibited foods for cows producing milk for this corporation is: Turnips, barley sprouts, brewery or distillery grains, linseed meal, glucose refuse, starch refuse, buffalo feed, ensilage, rancid oil cake, and gluten meal. Other rules of this corporation which are of unquestionable benefit to the milk supply provide for thorough lighting and ventilation of stables, and whitewashing once a year, together with much care as to cleanliness. The milk room must be separate from the stable, and the entrance to it can not be through a partition or door opening directly from the stable; the milk must be cooled to 58° F. or lower within forty-five minutes; any representative of the corporation shall have the right to inspect any of the stables in which milk is produced for it; night's and morning's milk must be kept separate.

None of the other dealers go so far as the above. One large corporation which does a large business in milk of superior quality has no rules at all, at least no arbitrary list of "thou-shalt-nots," but it merely requires that the milk it buys shall be as good as the best or as good as modern skill can produce. If the milk meets the demands of the purchaser, no questions are asked as to details of production or whether this or that food was fed. This corporation proceeds on the theory that to produce the results which it requires everything must be about right.

Besides the precautions of dealers to secure clean, good milk, health officers are continually on the alert to detect the more flagrant violations of the ordinary rules of care and cleanliness. When the well is found too near the stable, when the surroundings are dirty, or when the cows are kept in dark filthy stables, there is official action.

In some of the milk-producing sections 40 to 50 cows are regarded as an average dairy herd, though in some instances there are as many

as 100 cows in a herd. In other sections from 20 to 25 cows are considered an average herd. Few who live any considerable distance from a creamery produce less than one can of milk per day. The farmers for the most part live within 5 or 6 miles of the creamery and deliver the milk in the morning. This necessitates artificial cooling of the night's milk, which is done in spring-houses or in tanks of ice water. The use of ice is increasing, and in some portions of the territory the gathering of the ice crop in winter is considered almost as important a task as the gathering of the hay crop in the summer. If the night's milk is not below 60° F. when delivered in the morning, it may be rejected. The cooling of the morning's milk depends on the distance the farmer lives from the station. One large dealer has a sliding scale of temperatures for milk delivered, as follows:

	°F.
Night's milk delivered the next morning	50
Morning's milk produced within 1 mile of station and delivered before 7 a. m	60
Morning's milk produced within 2 miles of the station and delivered before 8 a. m	55
Morning's milk delivered after 9 a. m	52

Usually the milk is delivered by 9 o'clock, though there is some difference in time at different stations, depending on the time the milk train leaves. As one stands near a shipping station in the morning he will see every conceivable kind of vehicle drive up to the station door. Some have one horse, others have two, and still others four. As a rule, the wagons have no particular facilities for keeping the milk cool in the summer, except a canvas thrown over the load. The farmers usually own the cans used in the delivery of their milk. When the cans are emptied at the creamery they are rinsed, washed, and then scalded with steam, thus rendering them sterile. In a few minutes after the farmer reaches the station with his milk it has been unloaded and clean cans returned to him.

In some localities the farmers live as far as 12 miles from the creamery, and in such cases there is a different system of getting the milk to the central depot. A collector has a specially built wagon which will carry 40 cans. These collectors are nominally employed by the farmers, but ordinarily the amount due them is deducted from the farmer's check at the creamery, where the collector gets his payment. The usual price for collecting milk is about 10 cents per hundred pounds, the amount varying somewhat according to distance and local conditions. Just before the collector is due in the morning the farmer takes the milk from the cooling tank and places the cans on a little roadside platform, from which the collector takes them. Sometimes the farmer does not live on a road over which the collector passes. In such case the producer meets the collector at the

junction of the roads. When milk is transported long distances in wagons, there are facilities for refrigeration, and sometimes the milk is also iced en route. Some of the contracts with the buyers require the use of wagons with springs in transporting the milk to the creamery.

SHIPPING STATIONS OR CREAMERIES.

DESCRIPTION.

At each point from which milk is shipped to the city there is a building, sometimes known as a shipping station, but more frequently as a creamery. Here the milk is received from the farmers and prepared for shipment. Practically no milk is loaded directly from the producer's wagon into the milk car. These stations are located more or less closely together, according to the amount of dairying in the vicinity. In Orange County, the town of Warwick has 12 stations. In Delaware County, Stamford has 10 stations. Towns with 4 to 6 stations are frequent. On several lines of railroad the stations are at least within 5 miles of each other, and stations 2 or 3 miles apart are not uncommon. Most of the stations are owned by the city dealers, but a few are cooperative or have independent owners. Where the stations are near together they are usually owned by different dealers, and there is sometimes a little competition for the product of the neighboring dairies which can ship to one as well as to the other.

These stations vary greatly as to equipment. The most ordinary have merely a tank for ice water and cans, with a small boiler to produce hot water or steam for washing cans and other utensils. The more elaborate establishments are equipped with clarifier, pasteurizer, bottling machine, bottle washer, separator, churn, cream vat, sterilizing plant, ice crusher, condensery, and, in some instances, repair shop for mending cans and bottle boxes. In every case there is an ice house either attached to the creamery or located very near. Usually a railroad side track runs close to the building for convenience in loading. In some instances a dwelling house is connected with the creamery.

The variation in quality of the equipment in the creameries is very great. In some of the poorer creameries the tanks and floors are of wood; and even where the attendant is very careful the water-soaked and partially decayed wood offers a condition far from ideal; and where there is considerable carelessness in spilling milk and no pains is taken to clear up the neglected corners the condition becomes very bad. The board of health has found the conditions in some cases so bad that it has revoked the corporation's permit to sell milk in New York City. At the other extreme are the creameries of the

large corporations with a fancy trade and plenty of capital. Here we find cement floors, tile walls, and everything bright and shining. Utensils, vats, and tanks are sterilized with live steam, machinery is thoroughly cleaned, while plenty of water is conveyed in hose to floors and walls. The floors are slightly concave, so that the water quickly drains off and they soon become dry.

HANDLING MILK AT THE STATIONS.

In the simplest of these stations the milk is received from the farmer, emptied from his cans, and mixed and cooled for sending to the city in the 40-quart cans. The cans of milk are set in tanks, which are usually so placed that the top is level with the floor in order to save lifting. The cans are placed in ice water and the milk is occasionally stirred, so that it will cool evenly throughout. The stirring is done with a flat disk several inches in diameter, to which a handle is attached at right angles with the disk. Raising and lowering the disk thoroughly stirs the milk.

In the more pretentious creameries milk is clarified, pasteurized, or blended, according to the kind of business done. The bottled milk of the city is largely put up at these creameries. Several of them are also condensing establishments. Many of them put up pot cheese, and the large city demand for buttermilk is met by churning skim milk. The surplus is regulated at the creamery as much as possible rather than in the city. Supplies are ordered from day to day by telegraph at the latest moment possible. Any surplus is left at the creamery to be worked up into butter or to be condensed. Many of these creameries have separators, by means of which the dealers' supply of cream is secured. The State has a low fat standard for milk (3 per cent), and many producers feel that sometimes whole milk is partially skimmed so that a dealer can get quite a cream supply by bringing his milk supply down to a 3 per cent basis.

The higher the standing of the dealer the better the condition of his creamery. Dealers who sell to others to sell again have a minimum of responsibility, and the condition of the places belonging to them does not average so good.

It is estimated by Darlington that about one-third of the city milk supply is sold in bottles. Most of this is bottled in these creameries. The remainder—the two-thirds—is shipped to the city in cans to supply the large customers, like hotels, restaurants, institutions, and grocers, also a few peddlers.

These shipping stations are not only subject to the inspection of the city board of health, which can refuse permits to city dealers if the country conditions are not all right, but the State agricultural

department has direct supervision of them and can make suggestions as to changes.

The empty cans come back from the city dirty, and are washed at these creameries. When the cans have stood some time in a grocery store or near a kitchen fire their condition is bad, and this negligence is criticised by health authorities. But there is every facility at the creamery for giving them a thorough cleansing.

CARS USED FOR TRANSPORTING MILK.

The cars used in transporting milk to New York City are practically the same over the whole of the territory. The only differences are in size and minor details. In external appearance they are like ordinary express cars, with one central door on each side. In a few instances there are end doors. The word "Milk" is painted on each side of the car, with the name of the railroad corporation. The entire space inside the car is in one compartment. Having no partitions, the cars can easily be kept clean by flushing with water. This is usually done daily in summer. The construction of the cars is similar to that of the familiar refrigerator cars. The walls are double, and there is a trap door in the roof for loading ice, with ventilating openings in the sides near the bottom. Most of the cars are piped for steam so that the milk can be kept from freezing in the winter. These cars are all of the time under the direct control of the railroads. The railroad company therefore assumes the responsibility for the care of the milk en route, and takes entire charge of the refrigeration in the summer. For this purpose it has icing stations on long runs, where the cars are iced, either at the top or by placing cakes of ice among the milk cans.

Where the shipping station is a large one, a car is placed on the railroad siding near the building, and the men employed about the creamery load the cans or boxes of bottles. When the milk train arrives, all that is necessary is to back onto the siding and connect with the car. In the case of small creameries the milk is loaded while the train waits. Sometimes the work is merely twirling the cans across a gangway into the car door. In other cases the trainmen have to carry the cans or boxes across a track. Sometimes, when the station stands back from the railroad track, there is a loading platform near the track, connected with the creamery by a bridge, and the manager has the cans on the loading platform before the train arrives, which greatly facilitates the work.

DESCRIPTION OF A MILK ROUTE.

The following details of a trip on a milk train from Binghamton

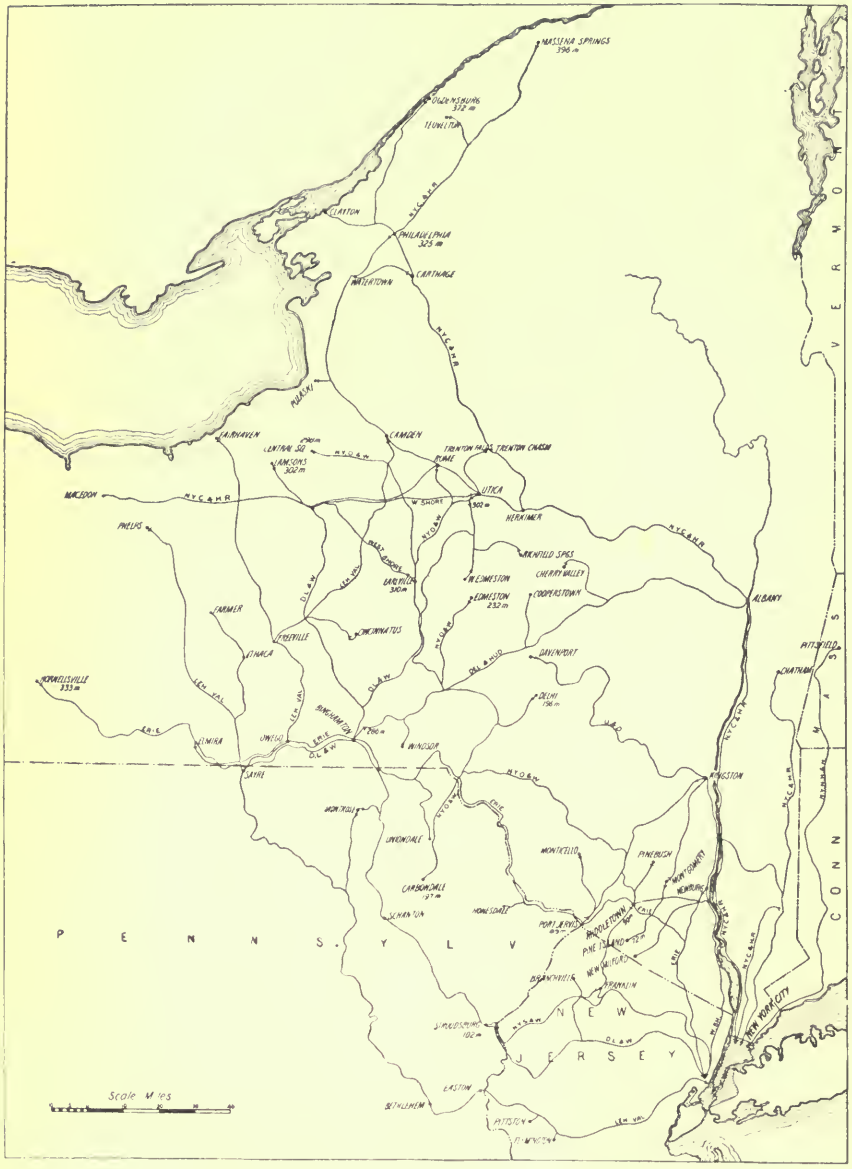

FIG. 3. Map showing the source of New York's milk supply.

to Albany will not only describe that particular route, but, so far as it is typical, will throw light on the general methods practiced:

The train leaves Binghamton at 9.15 a. m. with three empty milk cars and two passenger coaches. The few passengers are for local

points not far distant from Binghamton. Eleven miles out the first milk is taken, 40 cans being loaded from a rather dingy looking creamery. After a ride of 4 miles a stop is made at a station where 13 cases of bottled milk are loaded. After 3 miles more, we come to a station where there is a creamery which utilizes all the milk locally. Three miles farther on about 100 cases of bottled milk are taken on. A mile beyond, at Nineveh Junction, a whole car which has come down a branch road is attached to the train. Afton, 5 miles beyond, is reached at 10.20, and at this place between 60 and 70 cans are loaded. Six miles more brings us to Bainbridge, where another car is coupled to the train, near a bright, white creamery. Some of the milk for this creamery is hauled from farms 8 and 10 miles distant. As we get farther down the grade the valley broadens, and many thrifty farms are seen. Nine miles farther yet, after being on the road two hours, two cars are picked up; 5 miles more and another car is taken, and after 4 miles still another. At this last station nearly two carloads are shipped, so that there is a considerable amount to be loaded by the trainmen. At Oneonta a car is added, and 6 miles beyond something like 100 cases of bottles are loaded. The next five stations are from 3 to 5 miles apart, and at each one of these a considerable quantity of milk is loaded, in one case 105 cans. Cobleskill is reached about 3 p. m., where a car is coupled to the train, which waits for all the cars to be iced; this is done by placing a cake of ice in the space between groups of four cans each. A few more small lots of milk are loaded at different stations. Albany, 143 miles from Binghamton, is reached at 4.40 p. m., seven hours and twenty-five minutes from the start. Here the cars brought in over the several roads are made up into a long train, and at 8.20 the train is rushing at high speed to New York City.

The loading of the milk on this train is done by the trainmen, and the record of the shipments is kept by the conductor, just as the conductor of an ordinary freight train keeps record of the numbers on the cars, waybills, etc.

FREIGHT RATES.

Freight rates on milk to New York City are based on a zone system recommended by the Interstate Commerce Commission, and are as follows on 40-quart cans:

	Cents per can.
Up to 40 miles	23
Between 40 and 100 miles	26
Between 100 and 200 miles	29
200 miles and over	32

This system of rates is followed by all of the roads, the only apparent difference being in the case of the New York Central Railway, which makes one rate for a whole division for those dealers on the east

side of the Hudson River. These division rates have a relation to the rates of the foregoing table, being near to the rate of the zone in which the most distant point of the division is located. This system of the Central Railway makes it possible for a shipper on one division to pay more than one on another division living the same distance from the city.

The railroads seem to be in substantial agreement as to the freight on cream, which, with but few exceptions, is 18 cents per can more than the freight on milk. The transportation costs no more, but the extra charge is justified on the principle defended by many economists, that the cost of an article, or its value, is a proper element to consider in fixing the freight charge.

The freight charges on bottled milk and cream are less uniform than on the same commodities in bulk. The tendency of the railroads is to advance the rate on the bottled goods. In several instances there has been an advance in these rates since the publication of Bulletin No. 25 of the Division of Statistics (1902). The published rates of the railroad companies do not have any common unit. For instance, some quote rates by the case, which may contain quarts or pints, or anywhere from 10 to 24 bottles to the case. In the following table the computation has been made on the basis of the quart; when the milk or cream is put up in quart bottles, 12 to the case are understood:

Freight rates on milk and cream carried into New York City.

Zone.	Railroad.	40-quart cans.		Quart bottles.	
		Milk.	Cream.	Milk.	Cream.
		Cents.	*Cents.*	*Cents.*	*Cents.*
First zone	Erie	23	41	0.80	1.43
	West Shore	23	41	.77	1.22
	D., L. & W	23	41	.81	1.43
	Lehigh Valley	23	36	.83	.....
Second zone	Erie	26	44	.91	1.54
	West Shore	26	44	.85	1.30
	D., L. & W	26	44	.91	1.54
	N. Y., O. & W	26	44	.91	1.54
	Lehigh Valley	25	36	.83	.....
	N. Y., N. H. & H	25	30	.87	1.05
Third zone	Erie	29	47	1.01	1.64
	West Shore	29	47	.92	1.37
	D., L. & W	29	47	1.00	1.64
	N. Y., O. & W	29	47	1.01	1.64
	N. Y. C., main line	29	47	1.02	1.64
Fourth zone	Erie	32	50	1.12	1.75
	West Shore	32	50	1.00	1.45
	D., L. & W	32	50	1.11	1.75
	N. Y., O. & W	32	50	1.12	1.75
	Lehigh Valley	32	50	1.12	1.75
	N. Y. C	32	50	1.12	1.75
	N. Y. C., R. W. & O. Div	.....	.....	1.45	.....

Freight rates on milk and cream carried into New York City—Continued.

Zone.	Railroad.	40-quart cans.		Quart bottles.	
		Milk.	Cream.	Milk.	Cream.
		Cents.	*Cents.*	*Cents.*	*Cents.*
New York Central (divisions east of Hudson River).	Putnam division (most remote point 54 miles.)	25	30	.87	1.05
	Harlem division (most remote point 127 miles).	25	35	.87	1.22
	Hudson division (most remote point 148 miles).	30	40	1.05	1.40

Taking the 26-cent zone for illustration, it will be seen that the rate per quart when the milk is in cans is 0.65 cent; when it is in glass bottles, packed in substantial wooden cases filled with crushed ice, the rate is about 0.9 cent. The ratio of actual weight is about $2\frac{1}{2}$ to 1.

Most of the roads allow a discount of 20 per cent from the above rates for carload lots; hence the definition of a carload is of concern. The common case, containing a dozen quart bottles, when iced weighs 85 pounds, and 600 of these ordinarily constitute a carload. This is 7,200 quarts, or 51,000 pounds, although the weight is constantly lessening as the ice melts. The New York, Ontario and Western Railroad states that for the purpose of its freight tariff a carload must consist of at least 250 cans, or 7,000 quarts in bottles. This would be 10,000 quarts in cans, or 7,000 in bottles. The Delaware, Lackawanna and Western Railroad defines a carload as consisting of 9,000 quarts in cans, or 6,500 quarts in bottles.

MILK TRAINS.

HOW RUN, TIME, DISTANCE, ETC.

The milk cars are usually run in milk trains entirely distinct from the passenger service. In some instances, however, a passenger car is attached to a milk train during the portion of its run in which it is picking up the load of milk. In other instances, on some branch roads, the milk car is attached to a regular passenger train, or even to a freight train, the milk cars being made into a milk train at the junction. Exclusive milk trains are run on the fastest time of any trains on the road, and are drawn by the strongest and surest locomotives.

The prevailing manner of distributing milk in the city calls for the arrival of the trains in the night, generally between 10 o'clock and midnight. We have prepared a table showing the time the milk cars or trains leave some of the most remote points, the distance

traveled, and the time on the road. It is worthy of note that these trains pick up milk for long distances, and that milk produced near by reaches the city no sooner than that produced 300 miles away. The morning's milk always reaches the city before midnight, but there are places where the trains stop to take on fresh milk as late as from 2 to 6 o'clock in the afternoon.

Table showing time milk trains leave, distance traveled, and time on road.

Railroad.	Starting point.	Distance.	Time leaves.	Time arrives.	Time on road.
		Miles.	*a. m.*	*p. m.*	*h. m.*
N. Y., O. & W	Sidney, N. Y	201	10.35	10.10	11 35
	Central Square, N. Y	300	7.25	10.50	15 25
D., L. & W	Elmira, N. Y	264	8.40	9.33	12 53
	Syracuse, N. Y	287	9.05	10.22	13 17
	Utica, N. Y	302	9.30	10.36	13 6
	Richfield Springs	311	9.10	10.36	13 26
			p. m.		
N. Y., N. H. & H	Pittsfield, Mass	155	12.10	10.12	10 2
			a. m.		
Erie	Hornellsville, N. Y	332	8.07	10.15	14 8
			p. m.		
	Port Jervis	89	4.50		
	Pine Island	72	4 25		
			a. m		
Lehigh Valley	Clockville	387	8 04	10.30	14 26
N. Y. Central	Massena Springs	396	7.00	11.00	16 0
	Ogdensburg	372	11.00		
			p. m.		
N. Y., Sus. & W	Middletown, N. Y	90	3.10	10.30	7 20
	Stroudsburg, Pa	102	2.46	10.30	7 44

ARRIVAL IN THE CITY.

The milk trains arrive in New York City about the same time—from 10 to 11 o'clock at night. There are, however, several places of arrival—at Harlem River (One hundred and thirtieth street), at Highbridge, at Thirtieth street and Tenth avenue; but the great mass of the milk is delivered in New Jersey.

At the railroad terminals there are no special arrangements for the milk business aside from the covered platform to be found at all freight stations. The different dealers are on hand on the arrival of the trains to get their several supplies. There is no confusion, principally for the reason that there is not a large number of small dealers to complicate the delivery. Transportation from the railroads is done chiefly by large wagons drawn by three or four horses.

HANDLING MILK IN THE CITY.

When the large wagons leave the railroad stations they are driven to the headquarters of the different large dealers, where the load is

transferred to smaller wagons for distribution throughout the city. The city milk station is chiefly a combination of a counting room and a stable, the office being on the second floor, the first floor being devoted to space for wagons. Some of these places have a small refrigerator for keeping a little surplus milk, and occasionally there is a churn and other facilities for making butter of inferior quality from sour or surplus milk. In two or three instances large dealers have fitted up rooms for pasteurizing and bottling milk in the city. Where these large dealers retail milk from a store it is entirely separated from the main place of business.

Speaking in a general way, about one-third of the city supply is delivered in bottles and two-thirds in cans. The "can" milk goes to institutions, hotels, restaurants, and grocery stores. There are 7,000 such stores in the Borough of Manhattan.

HOW THE PRICE IS DETERMINED.

Three ways are in vogue for determining the price to be paid the producers. The first is by the New York Milk Exchange. This is an organization, nominally of representative producers and dealers, for the purpose of studying the situation from the standpoint of each and fixing a price, after a canvass of the supply, demand, and cost of production. The exchange has 17 directors, who determine the price of milk when conditions seem to warrant a change from the prevailing price. Sometimes the price is changed three times a month, although so frequent changes are not common. No definite advance contracts or prices are made by the exchange. The price fixed upon to-day is the price until another is determined upon. Of the seventeen directors, the secretary reports that more than one-third are producers. One of the largest dealers stated that two of the directors were farmers, while others are both producers and shippers. But the mass of the producers resent the claim that they have any representation in fixing the price. About three-fourths of the New York milk is bought on the exchange basis. The net price to the farmers is the exchange price, less three items—the zone freight rate, 5 cents per can as a ferriage charge on such milk as is landed in New Jersey, and a "station charge" of 10 cents per can. The exchange price in February, 1905, was $1.61 per can. In the second zone there would be deducted 26 cents freight, 5 cents ferriage, and 10 cents station charge. This would make the net price to the farmer $1.20, or 3 cents per quart. The station charge varies somewhat with the competition between different shippers when their creameries are located near each other.

Much milk which is paid for on the exchange basis is actually bought by the 100 pounds. The milk is weighed when delivered

by the farmer at the shipping station and then reduced to cans at 86 pounds to the can. In handling milk in large quantities the use of the words "can" and "quart" as units in price making seems to be decreasing and the system of paying by the 100 pounds is increasing.

The second way of paying for milk is that adopted by the largest purchasers, who buy for condensing as well as for direct sale, and who condense much of their surplus in seasons when there is an abundant production. These purchasers buy by the 100 pounds, but make a price for a period of six months in advance. It is claimed that the exchange price is influential as a basis in fixing this scale of prices, although the two do not always agree. The price paid per 100 pounds is a net price at the shipping station, "condensery," or creamery.

The third way of buying is by the 100 pounds on the basis of the fat in the milk. Samples are taken daily and tested. The agreed price is for milk testing 4.2 per cent, and 2 cents additional is paid for each one-tenth of 1 per cent of fat.

MILK SANITATION.

In handling an article as susceptible to contamination and deterioration as milk, the question of sanitation is important. The problem is also difficult, for it must deal with the thousands of producers, then with the conditions at the shipping stations, next with the manner of transportation, and finally with the manner of retailing in the city. Many of the smaller groceries have no facilities for keeping milk cool in the summer, and they give the city board of health much trouble. In one section it is stated that, "out of a total of 2,458 stores visited, only 451 were found where the milk was properly cooled and where there was no communication with living rooms."

The State agricultural department has direct supervision over the sanitary conditions in the country, especially at the shipping stations. Where the places are in bad condition, the department can require them to be cleaned up. The city board of health makes occasional investigations of the country conditions, and if they are insanitary the board refuses permits to sell milk in the city from such places. In this way a local board of officers can indirectly exercise supervision over matters beyond its jurisdiction.

PART III.—THE MILK SUPPLY OF PHILADELPHIA.

AMOUNT—SOURCES—CARS.

The milk supply of Philadelphia for the year 1903 was 111,242,000 quarts. This was received from the following sources:

		Quarts.
Pennsylvania Railroad		47,984,000
Reading Railroad:		
Near by	35,354,000	
Distant	3,488,000	
		38,842,000
Baltimore and Ohio Railroad		7,015,000
Lehigh Valley Railroad		10,201,000
Wagons (estimated)		7,200,000
Total		111,242,000

For six years the annual rate of increase has varied from 1,000,000 to 6,000,000 quarts and averaged nearly 3,000,000 quarts, rising from 93,959,000 to 111,242,000.

Stating the receipts for 1903 by percentages and rearranging the order of the above table, we have the following results:

	Per cent.
Pennsylvania Railroad	43.2
Reading Railroad (near by)	31.5
Baltimore and Ohio Railroad	6.3
Total near-by railroad milk	81.0
Wagon milk	6.3
Total near-by milk	87.3
Lehigh Valley Railroad	9.0
Reading Railroad (distant)	3.6
	12.6
Total	99.9

From the above table it will be seen that 87 per cent of the city's milk supply comes from comparatively near-by sources, chiefly in Pennsylvania and New Jersey, and some in Delaware. About 6 per cent is estimated to be brought into the city in wagons from dairies near the city or situated within the territorial limits of the munici-

pality. Five thousand cows are reported within the city limits. The "wagon milk" is gradually growing less as the value of land near the city increases and becomes less available for dairying. Of the 93 per cent of the city milk which is transported to the city by railroad 81 per cent comes from within 60 miles. This milk is transported in ordinary baggage and express cars. No money is expended in fitting them up for milk cars; in fact, they are not even labeled. The Pennsylvania Railroad cars have two doors on each side, and the Reading Railroad cars have three. Most of the cars are piped for heating. A few have old-fashioned stoves, but none have any facilities for refrigeration. The cars are for the most part clean, but in some instances more attention to cleanliness on the part of the railroad companies would seem desirable. The cars are usually run in connection with passenger trains. In some instances the milk

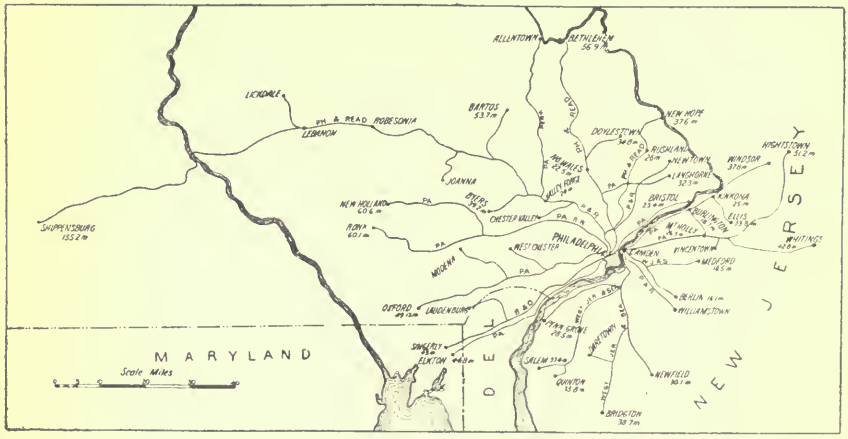

FIG. 4. Map showing the source of Philadelphia's milk supply.

cars start with passenger trains, but on reaching the junctions they are made up into a special milk train. In such cases there is usually no milk taken on between the junction and the city.

As the milk is transported in baggage cars on passenger trains, the transportation is closely connected with the passenger department of the railroads, and on the Pennsylvania system the business is entirely in charge of the latter department.

THE CANS.

Fully 90 per cent of the cans used in the business are owned by the farmers. Forty-quart cans are used for the most part, although there are some "30's" and a few "20's." The cans vary much in shape, some being much taller than others of the same capacity.

Many farmers paint their cans to assist in their preservation. A pile of cans at a large railroad station in Philadelphia presents less uniformity than in Boston or New York, as there are cans of various shapes, sizes, and ages; some are quite rusty and have the paint nearly all worn off. Sometimes the cans are kept in service longer than they should be; the covers especially become battered and otherwise out of repair, and some were found to be in an insanitary condition.

FREIGHT RATES, AND HOW PAID.

The farmers sell their milk, delivered in Philadelphia, at a definite price. Payment for transportation is made by a system of tickets, printed for convenience on common shipping tags. These tags are attached to the cans, which are not supposed to get on the train without tickets any more than are passengers. When the cans are loaded the baggage master goes through the car and takes up the tickets after the manner of the conductor, the difference being that the tickets are taken up by detaching the ticket portion of the tag on a perforated line. The tickets, each good for the transportation of a 20-quart can, are sold in bunches of 20 for $1.50, $2, or $3, depending on whether the milk has to be transferred at a junction. Other tickets are sold for 30-quart and 40-quart cans, although two 20-quart tickets will be taken for transporting a 40-quart can. Any farmer can buy a bunch of tickets and put his milk on any milk car. By this system no special privileges are shown to anyone, and even the smallest producer can ship milk to the city without any inconvenience and on as good terms and conditions as the largest shipper. In local language, rates are sometimes spoken of as a $2 rate or a $3 rate, according to the price of 20 tickets, but in order that the rate may be understood by those in other places it is placed on a 40-quart can basis. Twenty tickets for 20-quart cans sold for $1.50 is at the rate of 7½ cents per can, or 15 cents per 40-quart can. Fifteen cents will pay for transportation of 40 quarts of milk on the Pennsylvania division of the Pennsylvania Railroad from all points less than 60 miles from the city, where the cans are not transferred at junction points; in this case 5 cents extra is charged. The same price is charged on the Philadelphia, Baltimore and Washington division, from all points less than 30 miles; on the United Railroads of New Jersey division, from Bristol, Langhorne (32.3 miles), Burlington, N. J., Mount Holly, N. J. (19.1 miles), and intermediate points; on the West Jersey and Seashore division, from all points (the extremes from which milk is shipped are 38 and 51 miles); on the Baltimore and Ohio, from all points from which milk is shipped, none being over 43 miles; on the Philadelphia and Reading, from points as far out as Newtown (26.3 miles), Rushland (26 miles),

North Wales (22.5 miles), Valley Forge (21 miles); and on the Philadelphia and Reading, over Baltimore and Ohio, less than 80 miles.

Twenty cents will pay for transportation of 40 quarts of milk on the Pennsylvania division of the Pennsylvania Railroad from points within 60 miles where there is a transfer; on the Philadelphia, Baltimore and Washington division, from points between 30 and 50 miles; on the United Railroads of New Jersey division, from all points from which milk is shipped beyond those in 15-cent class above; on the Philadelphia and Reading, from all points from which milk is shipped beyond those in the 15-cent class above (except for long distance as shown below). Twenty-five cents will pay for transportation of 40 quarts of milk on the Philadelphia, Baltimore and Washington division of the Pennsylvania Railroad for distances between 50 and 75 miles, but little milk is shipped from these distances. The same statement will apply to shipments between 60 and 90 miles on the Pennsylvania division. The rate is also 25 cents between Hightstown and Lewiston, N. J., but this is a 20-cent rate plus 5 cents for transfer.

The rate for cream is double the rate for milk. Two milk tickets are required on a cream can.

Three and a half million quarts, or about 3.6 per cent of the city supply, comes long distances over the Philadelphia and Reading road. This milk dispatch consists of three or four cars which run on a fast freight without refrigeration facilities. The milk is waybilled the same as other freight, and the rates are: On milk from Lebanon Valley and Shippensburg, respectively, for 20 quarts, 20 and 21 cents; for 40 quarts, 30 and 32 cents; on cream, 20 quarts, 30 and 32½ cents; 40 quarts, 50 and 55 cents.

Ten million quarts, or about 9 per cent of the supply, is received from New York State from about ten shipping stations. These stations are owned by seven Philadelphia dealers. This milk comes on the Lehigh Valley road with the train for New York City to Bethlehem, where the train is divided, part going to New York and the rest to Philadelphia. The most remote car starts from Fairhaven, on Lake Ontario, 353 miles from Philadelphia. This milk comes in the usual type of New York milk cars, provided with refrigeration facilities in the summer.

TIME OF STARTING—ARRIVAL.

The near-by railroad milk (about 81 per cent of the whole) starts from the country at the terminal points of the several branches or divisions from 5.30 to 6.30 o'clock in the morning and arrives at the milk stations in the city at from 7 to 9 o'clock, much of it being on the

road only two hours, and some even less. This short run accounts for the lack of special cars and refrigerating facilities. The shippers and railroads claim that if the milk is properly cooled by the producer and then promptly put on ice by the dealer in the city it can not suffer deterioration during the short time it is in transportation.

The long-distance railroad milk reaches the city about midnight. The Philadelphia and Reading train leaves for the city early in the afternoon. The car which starts from Fairhaven, N. Y., leaves at 6.30 in the morning.

The milk which arrives in the forenoon is taken to the milk depots of the dealers for bottling, if to be sold in bottles, and all is put on ice for delivery the next morning. The long-distance milk is taken from the cars for more speedy delivery the same morning. The trains which collect milk from near-by as well as distant stations take both morning milk and milk of the previous evening. Milk produced over 300 miles from the city and that produced within 20 miles is delivered to the consumer at the same time. One large dealer who has both near-by and distant milk claims that the milk coming 200 and 300 miles reaches the city in as good condition as milk produced nearer, for the reason that it has thorough refrigeration in transit, and extra precaution is taken in its production and preparation for transportation.

The milk business in which Philadelphia is concerned has practically no wholesalers; that is, there is practically no milk sold by dealers to be sold again, except in the case of a few grocers. All dealers, except grocers and provision storekeepers who handle milk, buy of the farmers direct and then go to the train for their supplies each forenoon as soon as the train is due. The nearest approach to a middleman is a broker or agent at some stations. Sometimes, if a farmer wants to take up the milk-shipping business and has no customer, he consigns his supply to this broker, who disposes of the product to the best advantage, usually on the platform at the railroad; he has no teams, cans, or storage facilities. When the smaller dealers occasionally want a little extra milk, they can get it of this broker.

THE PHILADELPHIA MILK DEPOTS.

Most of the Philadelphia milk is received at three railroad stations, one across the river in Camden and two in the city. At each of the city stations—Thirty-first and Chestnut streets and Third and Berk streets—there is a long shed with platforms where the milk is unloaded and the cars again filled with empty cans, and where the dealers handle their milk. Wagons of every conceivable style and condition as regards paint and cleanliness can be found standing at the plat-

forms of these stations. The greater part of these have canopy tops. Many are covered with signs and advertisements. The word "Alderney" is popular for advertising milk in Philadelphia.

The scene is decidedly animated at these stations when a train is in. Flitting among the men and cans is an occasional officer of the city health department or an agent of the dealers' association taking samples, the former for the enforcement of the law and the latter for the information and protection of the dealers who cooperate in this work. The inspector has a utensil which stirs the milk by means of a broad flange and takes a sample at the same time.

THE CAMDEN MILK DEPOT.

At Camden, N. J., 28,300,000 quarts of milk were received in 1903. Of this amount, 3,400,000 quarts were for Camden and the remainder for Philadelphia. The statistics relating to Philadelphia are exclusively for the municipality and do not include suburban territory. The freight rate on the New Jersey milk is to Philadelphia, which is reached by ferry across the Delaware River from Camden. The milk is delivered to the dealers at Camden, but they are given free tickets across the ferry, which is controlled by the railroad company. The number of milk teams crossing the ferry in 1903 was 32,297 one-horse, 8,455 two-horse, and 1,331 three-horse or four-horse—a total of 42,083, and a daily average of 115. It will be noticed that the one-horse wagons are in the majority. This also indicates the proportion of small dealers in the business, all of whom buy direct from the farmers. The cars come in mostly on one track, parallel with the tracks in the passenger station, and on one side of the station building. The milk-car track has a shed of its own, the cars running in on one side, while the wagons back up on the other. The shed is 500 feet long, and, during the busiest day of the summer of 1904, 109,900 quarts were handled. The daily number of cars is about 16.

The conditions described at Camden are similar to those at the railway station in the city except that the latter are not so near the passenger depot and the milk cars can not be removed from the passenger trains quite so conveniently.

RECEIVING STATIONS COMPARED WITH THOSE OF BOSTON.

The Boston milk-receiving stations are situated on spur tracks of the railroads, under control by ownership or lease of the milk companies, and they include large buildings, with executive and business offices as well as an abundance of facilities for handling milk at wholesale and retail, including mixers, refrigerators, storage tanks, butter-making outfit, bottling machinery, etc. In some cases the mixing

tank is placed in the car and the milk poured into it and pumped to coolers and refrigerator tanks on an upper floor, thus economizing labor to a great extent.

At Philadelphia the method is quite different. At the railroads there is no outlay for handling milk except the sidetrack with a shed overhead, as in the case of any freight track. Here the cars are switched, each car having milk possibly for a score of different dealers. To these sheds come all the milk peddlers of the city in every conceivable style of vehicle. There is a busy time unloading these cars and sorting out each dealer's milk, getting it on his wagon, and loading into the cars the empty cans. This work is supervised by an official of the railroad, who has a gang of men under him to help in the work. Some of the largest dealers (reported to handle as high as 21,000 quarts per day) are there with their three-horse wagons, which hold 100 40-quart cans each. The small dealer who handles only two cans is also on hand with his small delivery wagon. The Philadelphia system is extremely democratic. The smallest has equal privileges with the largest.

PLACES OF THE DEALERS.

While the Philadelphia system requires that all but the very smallest dealers have a place of business for mixing, bottling, and storing milk, in New York much of the bottled milk for the family trade is bottled in the country, and a dealer can do a large business with no other city facilities than a stable and a counting room, the large loads from the railroads being shifted to the smaller delivery wagons in the stables without opening can or bottle. In Philadelphia, after the dealer has hauled his day's supply from the railroad to his place of business, his day's work is only just commenced. Then begins the mixing, cooling, bottling, icing, and loading for the next morning's delivery. These Philadelphia milk depots, scattered all over the city, present a great variety of conditions and keep the board of health busy with inspections; even then the conditions are far from ideal. There are some large dealers, veterans in the business, who have establishments which are all that could be required, while others are far from perfect.

The writer visited a milk depot fitted up in the basement of a residence. The milk was unloaded from a three-horse wagon onto the sidewalk, from which it was lowered to the basement by a small elevator. In the basement were all the appliances for mixing, bottling, and icing the milk and cream. The basement floor was of cement and well drained, and the premises clean. When the milk had been transferred from the wagon to the cellar, the sidewalk was scrubbed

with soap and hot water. In a rear room was a separator and churn for working up any surplus. The front room on the street floor was fitted up for a retail trade in milk and cream. The other portion of the building was used by the family. Here for the first time the writer saw quarter-pint bottles of cream, which retail for 7 cents, and seem to be in much favor in that locality. Another dealer's place of business occupied an entire building. It was a large establishment fitted with a wide range of machinery—pasteurizer, churn, separator, bottler, bottle washer, and artificial-ice plant; but the place had a dingy appearance, and although the floors were of cement, there was much woodwork which was badly watersoaked and somewhat musty.

CANS IN RELATION TO PRICES.

Comparison of the prices received for milk by producers supplying different markets is difficult because of the varying conditions. For example, the producers supplying the Philadelphia market not only pay the freight directly by a ticket on each can, as explained elsewhere, but also furnish the cans in which the milk is transported to the city. Consequently, to get at the net returns received by the farmers supplying the Philadelphia market the cost of the freight and the wear and tear on the cans must be deducted. In the case of the Boston supply, all cans are furnished by the wholesalers, and in the case of the New York supply the farmers' cans are used only for taking the milk from the farm to the railroad shipping station, being all the time under the personal care of the farmer or his agent. But in the Philadelphia milk supply the farmers' cans are loaded on the cars, go to the city, are hauled from the railroad station to the dealer's place of business, and then go back over the route again. Thus these cans are subjected to destructive wear, and the expense of maintaining cans in a large dairy must be considerable. It is this fact of the individual ownership of cans that leads to less uniformity in size and shape than in other places, and to the use in some instances of cans that are badly worn and quite rusty, while some of the covers are so dilapidated that perfect cleaning is impossible.

There has been some discussion between the producers and dealers as to the return of the cans in a clean condition, and the producers have at times attempted to secure legislation regarding this. The contention of the dealers is that the ordinary rules of business, applicable to all products, require the seller of any product to furnish a suitable package for its transportation. In some instances the dealers rinse the cans before returning them. The writer has seen cans rinsed at the railroad platform, the rinsings from one can being turned into a second, and so on through the whole number in the custody of the dealer.

SHIPPING TAGS.

The shipping tags on the milk cans are all arranged so that the night's and morning's milk may be distinguished. The tag can be divided at a perforated line and the part remaining on the can shows the age of the milk, while the other portion can go to bookkeeper or checking clerk, as desired.

THE PHILADELPHIA MILK EXCHANGE.

The Philadelphia Milk Exchange is an incorporated organization of dealers which handles the greater part of the milk received and sold in the city. These dealers consider matters of mutual interest. Such topics as enforcement of laws, insurance, stray cans, hours of Sunday work, etc., are discussed. Once a month the members meet to consider the price of milk for the coming month. After noting the market conditions, they determine what is a fair price, endeavoring to do justice to all concerned, but looking at matters, of course, from the dealer's standpoint. The price decided upon by the association is then paid to farmers supplying the milk. A representative of the producers' association has met with the exchange on a few occasions to fix the price, but the conference resulted in a failure to agree, and since then the exchange has fixed its own price. There have been some attempts at consolidation of the larger concerns in accordance with the spirit of the times, but they have never succeeded, largely on account of the unpopularity of "trusts."

BOTTLING AND STORING DEPOTS.

As already stated, the milk arrives in the city at 8 to 9.30 in the morning, as a rule, and large customers, who buy by the can, are frequently supplied at once, but most of the milk is carried to the place of business of the dealer, where it is bottled and, in the summer, placed on ice until the next morning. One estimate is that probably 75 per cent of the milk for the family trade is bottled. This milk is delivered at from 3 to 7 o'clock in the morning. On the second trip of the dealers a little "dipped" milk is sold to families who call for extra milk.

With such a large number of dealers of all nationalities and conditions the sanitary conditions in the bottling depots are naturally varied, but the board of health makes a systematic inspection of these places, and where the conditions are too bad and the dealers are persistent in their neglect to make improvements the board puts a stop to the business. The better class of dealers, who have more capital and larger interests at stake and a good reputation to maintain, voluntarily keep their establishments up to a high sanitary state; they consider this necessary to success in their business.

RULES FOR PRODUCERS.

There are no general rules for all the farmers as to the care of the milk. This is largely a personal matter with each dealer. Those who have a fine class of trade for a good quality of milk are compelled to be particular with the producers if they are to hold their trade.

Below are copies of two circulars sent out by dealers to their producers:

DIRECTIONS FOR THE CARE OF MILK

Remove the milk of every cow from the dairy at once to a clean, dry room, where the air is pure and sweet. Do not allow cans to remain in the stables while they are being filled. Strain the milk through a metal gauze and a flannel cloth.

AERATE AND COOL THE MILK AS SOON AS STRAINED.

The rapid aeration and cooling of milk are matters of great importance. Combined aerators and coolers, suitable for use with well water or ice water, can be had at any dairy-supply house at a small cost. By using one of these, the cow odor, the animal heat, and much of the dirt can be removed from milk in a few minutes.

The milk should be cooled to 45° if for shipment, or to 60° if for home use or delivery to a factory. Never mix fresh, warm milk with that which has been cooled.

DO NOT ALLOW THE MILK TO FREEZE.

When cans are hauled a distance, they should be full and carried in a spring wagon. In hot weather cover the cans, when moved in a wagon, with a clean wet blanket or canvas.

If milk is stored, it should be held in tanks of fresh cold water, renewing daily in a clean, cold, dry room. Clean all dairy utensils by first thoroughly rinsing them in warm water; then clean inside and out with a brush and hot water in which a cleansing material is dissolved; then rinse, and lastly sterilize by boiling water or steam. Use pure water only.

After cleaning, keep the utensils inverted in pure air and sun, if possible, until wanted for use. Old cans, in which parts of the tin are worn off, or where there are seams and cracks, are impossible to keep clean and should not be employed.

PHILADELPHIA, *May 1, 190–*.

DEAR SIR: We wish to caution you about *grassy milk*, as it is very objectionable to most people and causes much trouble and loss of sale, therefore we urge the utmost care in turning out cattle to grass. The first day they should be allowed to stay out a very short while; then increase the time limit a little each day until the effect wears off and the cow's system becomes used to the change of diet.

Watch for *garlic*, as it entirely spoils milk and cream for sale. Always use an *aerator*, winter and summer, and *ice*, when necessary, so as to get temperature of milk down to *40 or 50 degrees*. See that your *tins* are in good

condition and cleanly. Get the best *strainer* possible, as sediment is very unpleasant in milk.

If you will observe the foregoing rules, many of the evils of the milk business can be corrected.

Very respectfully, ——— ———.

USE OF ICE.

The use of ice is increasing, particularly in the level districts of New Jersey. In the hilly portions of Pennsylvania the producers depend to a considerable extent on the old-time spring houses, where the milk is cooled by running spring water of a temperature of some 52° to 54° F. These spring houses are "hold-overs" from old butter-making days. In some instances there is too much decaying wood about them to make them ideal. Dealers try to have the milk delivered at the station at from 55° to 60° F., and a few attempt to have the farmers cool it down to 52° or 53° F.

GENERAL REMARKS CONCERNING THE MILK BUSINESS IN THE COUNTRY.

For conveying the milk to the railroad stations the farmers use any farm wagons which they may happen to have. More mules are used for draft purposes than are seen in connection with the New York or Boston supply. The milk for the most part reaches the station only a few minutes before the train is due, and it is not many minutes from the farmer's wagon to the car.

The average dairy contains from 15 to 20 cows and produces from 80 to 120 quarts of milk daily. Some of the big dairies produce from 300 to 400 quarts of milk daily.

One of the great drawbacks to the business in Philadelphia, as elsewhere, is uneven production. Sometimes when there is a surplus, producers are asked to hold back one day's supply every seventh day. There is a large seashore demand from the New Jersey resorts, and this helps to even up the supply on the Philadelphia market. It is claimed that there is now a tendency among the farmers to more even production. One dealer said that many farmers who once produced, for instance, 160 quarts per day in the summer, and 40 in the winter, now produce 160 in the summer and 80 in the winter. The average farmer's haul was variously estimated at from 1½ to 2½ miles, with probably about 4 miles as the maximum. There are receiving stations in the country for handling most of the supply of long-distance milk.

One exception may be mentioned to the usual way of doing business. One dealer had a shipping station at which deliveries were made twice a day, the milk being brought in while still warm and promptly cooled and aerated at the station.

WORK OF THE PHILADELPHIA PEDIATRIC SOCIETY.

The Philadelphia Pediatric Society is, as the name implies, an association of Philadelphia physicians who are especially interested in the treatment of diseases of children. It was organized in 1895 for hearing and discussing papers on the disorders of children. A society with such a mission naturally early in its history considered the milk question, and in 1898 a committee was appointed to take some definite steps looking to securing better milk for babies (particularly those who were not strong) than could be obtained from the ordinary milk dealer. This committee submitted its report, which was accepted, and the scheme suggested was under way in 1900. This organization proceeded on the theory that the best milk for infant feeding is natural untreated milk from healthy cows, produced under sanitary conditions, and absolutely sweet and clean. The committee having this matter in charge is known as the "Milk Commission of the Philadelphia Pediatric Society." The work is done gratuitously for the sake of improving the milk supply, the only expense being for inspection, which is paid by the dairies inspected. The regulations call for the periodical examination of the health of the cows, the cleanliness of the dairy, the care and cleanliness observed in milking, the care of the utensils used, the nature and quality of the food, and the health of the employees on the farm. In more detail, this means that the cows must be tested with tuberculin, the stables must have an abundance of light, there must be some satisfactory system of ventilation, the dairy room must be free from stable odors, the stable gutters must be frequently cleaned, and the cows must be kept dry and clean; the stables must be so constructed that they can be kept clean at all times, the water supply must be pure, the dairy room must have a sterilizer for bottles and other utensils, and the milk must be immediately cooled and bottled in a room apart from the stable and free from odor and dust.

The milk which results from this care is regularly examined chemically and bacteriologically to ascertain if all of the requirements as to health and cleanliness have been met and to see that there is no adulteration. It must range from 1.029 to 1.034 specific gravity, be neutral or faintly acid in reaction, contain between 3.5 and 4.5 per cent proteid, from 4 to 5 per cent sugar, and not less than 3.5 per cent fat; it must be free from all contaminating foreign matter and from all addition of chemical substances or coloring matter. It must further be free from pus and injurious germs and have not more than 10,000 bacteria of any kind to the cubic centimeter. If milk meets all these conditions a certificate is issued. Cream is also certified to as to the amount of fat, and in the case of cream a bacterial limit of

25,000 is allowed. These certificates are issued each month and are good for that month only. If at any time the inspections show imperfect conditions, or if the milk in any way fails to come up to the standard, the certificates are withheld for the following month. The certificates read as follows:

PHILADELPHIA PEDIATRIC SOCIETY.

Milk commission certificate.

———— ————, 1905.

Milk from the dairy of ———— ———— has been recently examined by the experts of the milk commission and found to be fully up to the required standards. Another examination will be made within a month and, if satisfactory, new labels for the bottles will be issued, dated ————, 1905.

Notice the dates.

A facsimile of one of the certificates, printed in small size, accompanies each bottle of milk, either pasted over the mouth of the jar or otherwise attached to it.

When these regulations and this standard were adopted, the dairymen of the city were invited to avail themselves of the advantages offered by the society. The circular which was issued stated:

If you do not wish to have your milk so examined, the commission does nothing prejudicial to your interests; but it is believed that it would be to the advantage of the physicians and the better class of milk producers to have some such method of examination under the supervision of a committee appointed by the society, composed of physicians interested in the welfare and treatment of children.

Thus the matter of milk examination is entirely voluntary and no dairyman is obliged to enter into the scheme or to continue in it.

When the plan was broached it suggested considerable extra expense, with the uncertainty of getting any additional income. Consequently less than half a dozen dairies asked to have their milk certified. But those who did take up the matter found that there was a demand for that kind of milk, and the amount of milk and cream certified has gradually increased until at the present time the commission is putting out over 113,000 certificates per month, which represents the product of over 400 cows. This growth is regarded as satisfactory by the commission and the reputation of the plan is spreading, and inquiries concerning it are frequently received, some of them coming from foreign countries. One gratifying feature of the plan is its popularity with the public. Those who use this certified milk are perfectly willing to pay the extra price required. The interest in the measure is evidenced by the fact that if for any reason the certificate of any dairy is withheld, the fact is noticed at once by many consumers and inquiries are at once made of the commission as to the cause of the nonappearance of the certificate. In noting

the few dairymen who have adopted the plan of supplying certified milk it should be remembered that the standard is very high, because the prime object of the Pediatric Society is to get the best unpasteurized milk possible for infant feeding, rather than to raise the quality of the general city supply.

DESCRIPTION OF A CERTIFIED MILK DAIRY.

One dairy which has built up its business exclusively on the certified advertisement was visited by the writer. One hundred and fifty-five cows are milked. The cows are grade Guernseys and Holsteins. The cow barns are one story high, with monitor roof for ventilation. Windows are numerous, and the place fairly glistens with bright whitewash. The stanchions and all the supporting framework are of iron pipe. The floor is of cement. As each cow is milked the milk is taken to an adjoining room, where an attendant weighs it, makes a record of the weight, and turns the milk into a 40-quart can. As soon as this is filled it is transported by a cable carrier to the dairy building. The interior of the dairy room is entirely of cement, including floors, walls, and ceiling. Screens keep out all flies. The dairy room is also fitted with all needed appliances for washing and sterilizing the bottles before milk is put into them. The sinks are of soapstone. The cooler hangs in the middle of the dairy room. There are no corners or angles to catch or conceal dirt, and everything is spotlessly clean.

Here the milk is cooled and bottled, the bottles placed in boxes holding one dozen each, and packed in ice. It leaves the farm at 9.35 p. m. and reaches the city at 11 p. m. The delivery begins about 3 in the morning. This dairy has its own teams and men in the city, so that the whole process of production and delivery is under its control.

When the milk is bottled the usual pasteboard cap is placed over the top of the bottle, then the certificate of the Pediatric Society is placed over that, and a round piece of parchment paper 5¼ inches in diameter is placed over the whole and held in place by a rubber band. On the top of the bottle the name of the dairy and the inscription "Five per cent butter fat" or "Four per cent butter fat," as the case may be, are in plain sight. Cream is put up in the same way, with a label "Sixteen per cent butter fat" or "Twenty-five per cent butter fat," as the case may be. This milk retails in Philadelphia for 12 cents per quart, or 7 cents per pint. It retails in Atlantic City in the summer for 16 cents per quart. It is sometimes claimed in other places that the public is not educated to know the different values of different grades of milk, but the customers of the dairy are very quick to note the fact and complain if by accident a driver may

happen to deliver a can of 4 per cent milk instead of 5 per cent. Both kinds, however, are retailed at the same price, as the managers claim that there is no difference in the cost of production.

This milk is regularly tested for bacteria, and usually ranges between 500 and 1,000 per cubic centimeter. In exceptional cases the number rises to 5,000. But the Pediatric Society allows 10,000. In this connection it is interesting to note, for purposes of comparison, that the Boston Board of Health has made a standard for the general supply of that city of 500,000.

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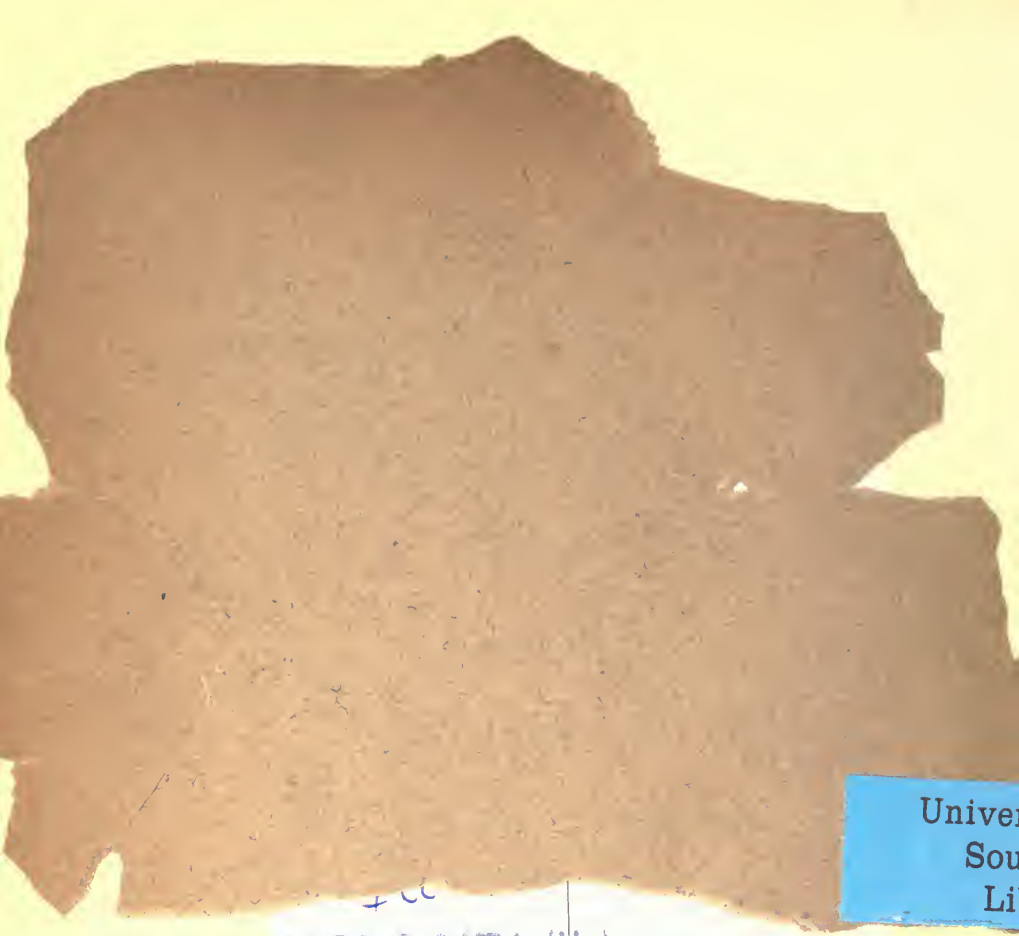
Dr. J. O. F. Price, care Brittain & Co., Marshalltown, Iowa.
Dr. R. A. Ramsay, Fargo, N. Dak.
Dr. A. G. G. Richardson, 707 Empire Building, Knoxville, Tenn.
Dr. A. E. Rishel, care Cudahy Packing Co., Los Angeles, Cal.
Dr. W. H. Rose, 18 Broadway, New York, N. Y.
Dr. F. L. Russell, Orono, Me.
Dr. J. F. Ryder, 141 Milk st., Boston, Mass.
Dr. E. P. Schaffter, care Cleveland Provision Co., Cleveland, Ohio.
Dr. C. A. Schaufler, 134 South Second st., Philadelphia, Pa.
Dr. Thos. W. Scott, care The Rath Packing Co., Waterloo, Iowa.
Dr. T. A. Shipley, care T. M. Sinclair & Co. (Ltd.), Cedar Rapids, Iowa.
Dr. N. C. Sorensen, care Kingan & Co., Indianapolis, Ind.
Mr. Wm. H. Wade, Animal Quarantine Station, Halethorp, Md.
Dr. H. N. Waller, 109 West 42d st., New York, N. Y.
Dr. G. W. Ward, Newport, Vt.
Dr. B. P. Wende, Live Stock Exchange Building, East Buffalo, N. Y.
Dr. W. H. Wray, 34 Streatham Hill, London, S.W., England.

DAIRY INSPECTORS.

M. W. Lang, room 23, Marine Building, Chicago, Ill.
Robert McAdam, room 23, Marine Building, Chicago, Ill.
E. A. McDonald, 58 and 59 Downs Block, Seattle, Wash.
B. F. Van Valkenburgh, 168 Chambers st., New York, N. Y.
Levi Wells (Bradford County), Spring Hill, Pa.
G. M. Whitaker, P. O. Box 1332, Boston, Mass.



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